

## Feasibility study

## Campus Ultuna

2014-06-19

#### Contact Bearing Consulting

#### United Kingdom

11 Pilgrim Street London EC4V 6RN United Kingdom Ph: +44 208 133 3125 Fax: +44 845 280 3818 Sweden Jakobs Torg 3, I tr III 52 Stockholm Sweden Ph: +46 84 II 87 I0 Fax: +46 85 010 9637

Spain

Ronda Universitat 33, I-1B 08007 Barcelona Spain Ph: +34 93 487 0478 Fax: +34 93 396 1973

#### Switzerland

Schutzenmattstrasse 53 4051 Basel Switzerland Ph: +41 22 575 2023 Fax: +41 22 594 8005

#### South Africa

Parktown Quarter Crn 3rd & 7th Ave Johannesburg 2193 South Africa Ph: +27 11 447 4630 Fax: +27 86 550 6730



Prepared for:	<b>Regionförbundet Uppsa</b> Att: Tomas Stavbom	la Län
Date:	19 <sup>th</sup> June 2014	
Prepared by:	<b>Bearing Group Ltd</b> Nils Gabrielsson Cecilia Magnergård Andjelija Vujovic Jörgen Eriksson Lars Almquist	Project Management, Interviews, Analysis Analysis Benchmarking and Research Expert, QA Interviews
Contact person:	Jörgen Eriksson	
Contact e-mail:	jorgen.eriksson@bearing-consulting.com	
Contact phone:	+46 70 681 2777	

Version	Date	Status	Updates	Author	Approved
1.0	5 <sup>th</sup> June 2014	Final draft	Complete document	NG, CM, AV, JE, LA	JE
1.01	19 <sup>th</sup> June 2014	Final version	Updates from SC meeting	JE, LA	JE



## Table of Contents

	TABLE OF CONTENTS			
I	UPF	SALA AND ULTUNA TODAY	4	
2	THE	E FEASIBILITY STUDY – MISSION AND APPROACH	5	
	2.1	The Internal World: Stakeholder Consultation	6	
	2.2	THE EXTERNAL WORLD: BENCHMARKING	7	
3	THE	EORETICAL FRAMEWORK FOR AN INNOVATIVE URBAN AREA - IUA	8	
	3.1	GLOBALISATION AND HYPER COMPETITION	8	
	3.2	INNOVATIVE URBAN AREA	10	
	3.3	CONCEPT FOR INNOVATIVE URBAN AREA (IUA)	11	
	3.4	THIRD GENERATION (3G) INNOVATION ENVIRONMENTS	11	
	3.4.1	Background to the third generation innovation environments	12	
	3.4.2	From science "parks" to urban innovation "clusters"	12	
	3.4.3	Third Generation Science Parks and urban dynamics		
	3.4.4	First Generation Science Parks: "Science Push"		
	3.4.5	Second Generation Science Parks: "Market Pull"		
	3.4.6	Emerging varieties of contemporary Science Parks		
	3.5	FIVE DESIGN ELEMENTS FOR CREATING SUCCESS		
	3.6	BEARINGS "A3-MODEL"	16	
4	AC	FORS AND CAPABILITIES WITHIN THE BIO-BASED ECONOMY IN UPPS	ALA	
<b>(</b>	NVÄRL	_DEN)	17	
	4.1	Proceeding		
	4.1.1	Sveriges Lantbruksuniversitet, SLU	17 17	
	4.1.1 4.1.2	Sveriges Lantbruksuniversitet, SLU Uppsala University		
	4.1.1 4.1.2 4.1.3	Kesearch Sveriges Lantbruksuniversitet, SLU Uppsala University The National Veterinary Institute, SVA		
	4.1.1 4.1.2 4.1.3 4.2	Kesearch Sveriges Lantbruksuniversitet, SLU Uppsala University The National Veterinary Institute, SVA INDUSTRY		
	4.1.1 4.1.2 4.1.3 4.2 4.2.1	Research Sveriges Lantbruksuniversitet, SLU Uppsala University The National Veterinary Institute, SVA INDUSTRY Basic facts		
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.1	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies		
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.2 4.2.3	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors		
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION		
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala	17 17 21 23 23 26 26 28 28 28 28 30 30	
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3 4.3.1 4.3.2	Kesearch         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala         Uppsala Brand	17 17 21 23 26 26 26 28 28 28 28 30 30 30 31	
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3 4.3.1 4.3.2 4.3.3	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala         Uppsala Brand         Real estate Configuration	17 17 21 23 26 26 28 28 28 30 30 30 31 32	
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3 4.3.1 4.3.2 4.3.3 4.3.4	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala         Uppsala Brand         Real estate Configuration         The (Real Estate) potential	17 17 21 23 23 26 26 28 28 28 30 30 30 31 32 32	
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3 4.3.1 4.3.2 4.3.3 4.3.4 4.3.4	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala         Uppsala Brand         Real estate Configuration         The (Real Estate) potential         INNOVATION SUPPORT (EXTRA UNIVERSITY)	17 17 21 23 26 26 26 28 28 28 30 30 30 31 32 32 33	
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3 4.3.1 4.3.2 4.3.3 4.3.4 4.4 4.4	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala         Uppsala Brand         Real estate Configuration         The (Real Estate) potential         INNOVATION SUPPORT (EXTRA UNIVERSITY)         STUNS	17 17 21 23 26 26 26 28 28 28 30 30 30 30 30 31 32 32 33 33 34	
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3.1 4.3.2 4.3.3 4.3.4 4.4.1 4.4.1 4.4.1	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala         Uppsala Brand         Real estate Configuration         The (Real Estate) potential         INNOVATION SUPPORT (EXTRA UNIVERSITY)         STUNS         UppsalaBIO	17 17 21 23 26 26 28 28 30 30 30 31 30 31 32 32 32 33 33 34 35	
	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3 4.3.1 4.3.2 4.3.3 4.3.4 4.4 4.4.1 4.4.2 4.4.3	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala         Uppsala Brand         Real estate Configuration         The (Real Estate) potential         INNOVATION SUPPORT (EXTRA UNIVERSITY)         STUNS         UppsalaBIO         UIC	17 17 21 23 26 26 26 28 28 30 30 30 31 30 31 32 32 32 33 33 34 35	
5	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3.1 4.3.2 4.3.3 4.3.4 4.4 4.4.1 4.4.2 4.4.3 <b>THE</b>	Research         Sveriges Lantbruksuniversitet, SLU         Uppsala University         The National Veterinary Institute, SVA         INDUSTRY         Basic facts         New bio-based companies.         Important industrial actors         EXISTING BUSINESS PARKS AND REAL ESTATE CONFIGURATION         Campus Ultuna in a growing Uppsala         Uppsala Brand         Real estate Configuration         The (Real Estate) potential.         INNOVATION SUPPORT (EXTRA UNIVERSITY)         STUNS         UppsalaBIO         UIC	17 17 21 23 26 26 28 28 30 30 30 31 30 31 32 32 32 33 33 34 34 35 35 35 36	
5	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3 4.3.1 4.3.2 4.3.3 4.3.4 4.4 4.4.1 4.4.2 4.4.3 <b>THE</b> 5.1	KESEARCH         Sveriges Lantbruksuniversitet, SLU	17 17 21 23 26 26 26 28 28 28 30 30 30 30 30 30 30 31 32 32 32 32 33 33 34 34 35 35 35 36	
5	4.1.1 4.1.2 4.1.3 4.2 4.2.1 4.2.2 4.2.3 4.3 4.3.1 4.3.2 4.3.3 4.3.4 4.4 4.4.1 4.4.2 4.4.3 <b>THE</b> 5.1 5.1.1	KESEARCH         Sveriges Lantbruksuniversitet, SLU	17 17 21 23 26 26 26 28 28 30 30 30 30 30 31 32 32 33 34 35 35 35 36 36 36 36	



	5.1.3	Case #2 - Wageningen University and Research Centre	37
	5.1.4	Case #3 - Agropolis International Science Park	37
	5.1.5	Case #4 – Copenhagen Bio Science Park, COBIS	38
	5.1.6	Case #5 - Innovation Science Park Aston	38
	5.1.7	Case #6 - AREA Science Park, Trieste	39
	5.1.8	Case #7 - IDEON Science Park, Lund	39
	5.1.9	Conclusions	39
	5.2	OUTLOOK AT NATIONAL AND INTERNATIONAL POLICIES AND STRATEGIES	40
	5.2.1	European Research and Innovation Strategy for a Bio-based Economy	40
	5.2.2	Swedish Research and Innovation Strategy for a Bio-based Economy	42
	5.2.3	Bio-economy strategy in Flanders, Belgium	43
	5.3	EXTERNAL FUNDING SOURCES FOR THE DEVELOPMENT OF CAMPUS ULTUNA	46
	5.3.1	Purpose of external funding	47
	5.3.2	The actors and their tasks	47
	5.3.3	Available funding programs and instruments	48
	5.3.4	Overview of funding opportunities	51
	5.3.5	Remarks	51
6	ANA	ALYSIS OF POTENTIAL	53
	61		53
	611	Strong hipeconomy sectors	55
	612	Strong science and technology areas	56
	613	Alignment with international and national bolicy and strategy	58
	62	FROM COMPETENCES TO UNIOUE MARKET OFFERINGS	60
	6.3		62
	631	Start-ubs	62
	6.3.2	Relocation companies	63
	6.3.3	Large companies and organisations	63
	6.3.4	Summary of estimated potential	64
7	SUM		65
'	301	IMART AND RECOMMENDATIONS -ROAD ANEAD FOR OUT ONA	05
	7.1	PROPOSED PROFILE FOR CAMPUS ULTUNA	65
	7.2	RECOMMENDED KEY ACTIONS	66
	7.2.1	Short term actions	68
	7.2.2	Medium-tem actions	68
	7.2.3	Long-term actions	68
	7.3	Performance goals	69
	7.4	Risk assessment	69



## I Uppsala and Ultuna today

It has been said that geography is destiny. In that case destiny smiles on Uppsala, The location, on the old waterways that controlled central Sweden during the time when present-day Sweden was being formed, was excellent. I 500 years later the location is still excellent, close to Stockholm and close to the Arlanda Airport.

Long before Christianity came to Sweden, Uppsala was the religious centre of the then embryonic Swedish state. Due to its historical importance the first University in the Nordics was founded in Uppsala in 1477. With the University in place the foundation was laid for future growth, and from there the city has grown, initially slowly but nowadays faster and faster, forming together with Stockholm the main growth engine area of Sweden.

The Uppsala University, the Academic Hospital, with roots from 1708, and the Agricultural University founded 1977 with its main campus in Ultuna, where an agricultural institute had been inaugurated already in the 1840s have all contributed into making Uppsala a city of knowledge and excellence.

In today's world, success is built on knowledge and the main producer of knowledge is Academia. With the two Universities in town, Uppsala has the main ingredients for future growth in place. With this, with support from the municipality and the county (Regionförbundet) and in cooperation with civil society the foundations are in place for a prospering economy, for companies to start, grow and thrive.

This has already happened in Uppsala. In 1911 Pharmacia was founded in Stockholm. 1943 the company initiated a collaboration with chemists at Uppsala University and moved 1951 to Uppsala in order to be closer to its University partner. From there on Pharmacia grow to a world leading company and although sold to the US in 1995 the legacy lives on in Uppsala



Figure 1 - Population growth in Uppsala versus Stockholm municipality

Will it be possible to get other companies to move to Campus Ultuna for the reasons Pharmacia once moved to Uppsala? How can Campus Ultuna become a dynamic incubator attracting not only existing companies but facilitating the launch of new companies, building primarily on research done at the Agricultural University. These questions form the background to this report.



## 2 The feasibility study – mission and approach

The approach behind this feasibility study has been to undertake a methodological and structured investigation, including one-on-one stakeholder interviews in the local Ultuna area, and an analysis of similar best practices in the external world. The goal of this approach is to establish the unique assets and the requirements for profiling and developing the Ultuna Campus into an internationally leading research and innovation environment within the green industry.

The study also explains the theoretical framework behind the Innovative Urban Area concept, and how it can be adapted for Campus Ultuna's plans, as well as setting out the recommendations and the road ahead for Ultuna with short, medium and long term actions.

This feasibility study has therefore been structured and undertaken in accordance with into four key areas:

- I. Internal World: Identification and engagement of stakeholders
- 2. External World: benchmarking
- 3. The Potential
- 4. Analysis for the future steps

Based on these steps, the feasibility study has been structured as an analysis of the current conditions of Campus Ultuna, looking at the long-term potential, including the R & I environment for green industries. The conclusion and outcomes of our research and analysis will enable a strengthening of the following areas of development of the Campus Ultuna:

- Clear and strong arguments for the continued development of Campus Ultuna;
- Clarity on the areas with the highest potential;
- A confident strategic fit at national and international level;
- Optimization of the cooperation between industry, academia, government and civil society;
- Strategy, tactics and milestones for R & I-funded programs.

A feasibility study in this context is a preparatory study with the following purposes:

- To find out if the assets, actors and shared vision exists or can be mobilized, to base a regional development project on.
- To clarify the vision of the potential project at a high level.
- To clarify which stakeholders are to be involved in the following phases of the project: initiation, project planning and project implementation.





The feasibility should be followed by the development of an integrated project where the unique differentiation (sweet spot) of the Ultuna Campus place brand is emphasised through enhanced awareness of the significant research and innovation at the core. By including and involving developments throughout all four quadrants of the Quad Helix model, within **Government** the **Academic** sector, **Civil Society** and the **Business** sector, the campus can establish a strong foundation for development.

#### 2.1 The Internal World: Stakeholder Consultation

All relevant stakeholders were identified and invited to individual meetings with the Bearing team. Spending the time to identify and to reach out to the relevant stakeholders was an important task conducted early on during this process. This report documents the stakeholder engagement process and the outcome of the initial investigations carried out during the feasibility study.

The identification of stakeholders was carried out in two stages. The first stage was to engage the working group which had already been formed to jointly investigate the possibilities of developing the green industry in the area Ultuna Campus. This group were invited to submit proposals on the potential stakeholders that should be covered by the study.



The second stage was integrated into the individual interviews where the representatives met were asked to provide their suggestions for additional organizations and key individuals who should also be involved. By using this approach extensive stakeholder consultation was carried out at the local, regional and national level.

The engagement undertaken by the Bearing team successfully allowed us to carry out both a vertical top down and bottom up analysis and horizontal level analysis of the local context and issues.

The Stakeholder Consultation meetings undertaken during the feasibility study involved a series of "inclusive" briefing, investigation and feedback interviews and in-depth discussion. The team placed great emphasis to reach out to all stakeholders from the four sectors of society; Business, Civil Society, Government and Academia, as noted earlier in the "Quad Helix" model.

The initial feasibility study phase stakeholder consultation achieved the following key outcomes:

- I. Raised awareness of the potential and desire to develop the Campus Ultuna and its importance at a local, regional and national level, and gathered evidence.
- 2. Engaged and energised stakeholders, extracted their views and interests and enabled consensus building to commence.
- 3. Identified a growing group of key organisations and individuals and installed a sense of community and ownership into the idea of an integrated project.
- 4. Identified a number of additional stakeholders and issues which need to be explored further and addressed in more detail during the following stages of project preparation.
- 5. Identified fundamental local and regional challenges and possibilities within the project preparation and realisation stages.



By applying our methodology using the sweet spot analysis, both in our own investigations and during the interview and dialogues with stakeholders has helped clarify how Campus Ultuna can find the unique strengths and its sweet spot in the world of international competition.

#### 2.2 The External World: Benchmarking

Benchmarking is the process of comparing ones business processes and performance metrics to industry bests or best practices from other industries or countries. As we live in world of hyper competition and every place is competing on the international stage for market share and recognition, it is important to identify best practice examples from the world outside Campus Ultuna. This process must be structured and orderly, and involves establishing performance measures using comparative data about key business operations and processes from competing and leading site within the industry. In this way, one learns how well those firms perform and, more importantly, the business processes that explain why they are successful and what be applied to Campus Ultuna.

The benchmarking section of the report covers the extensive research carried out as part of the project. The complete benchmarking model and detailed data on Barcelona Biotechnology Sector, Wageningen University and Research Centre, Agropolis International Science Park, Copenhagen Bio Science Park, Innovation Science Park Aston, Area Science Park and IDEON Science Park are in a separate document titled "Bearing – Campus Ultuna benchmarking – 2014-05-10".



## 3 Theoretical framework for an Innovative Urban

#### 3.1 Globalisation and Hyper Competition

We live in a world of rapid development. Economic conditions have changed considerably in both the worlds industrialized and the worlds developing nations over the past three decades. The break with previous trends have become so marked that the accepted economic models of economics of scale for achieving success are facing a fundamental crisis. Instead, the combination of technologies and economies of scope has emerged as an important source of job creation, growth and business success.

By **globalisation**, most places and organisations realities today are characterised by competitive pressure and rapid changes in all forms, from customer demands to technological development. This competitive pressure has become a key feature of the new global economy. Not only is there more competition, there is also tougher and smarter competition. Consequently, competitive barriers to entry that were once considered permanent are gone and have been replaced by competitive advantages that continuously mutate and develop.

This new state is called **hyper competition**. It is a state in which the rate of change in the competitive rules of the game are in such flux that only the most adaptive and quick to change will survive. Customers want it quicker, cheaper, and they want it their way. This fundamental quantitative and qualitative shift in competition requires organizational change on an unprecedented scale, and the competitive advantages must constantly be reinvented.

During the 1960 and 1970s, and particularly following the oil crisis, most countries increasingly recognized that **innovation** was a crucial element of competitiveness in the manufacturing and service sectors. They began to develop technology policies either to stimulate the transfer of public research results to create new products and processes or to enhance private sector efforts to innovate, notably through increased investment in research and development. Peter Drucker's excellent book "Innovation and Entrepreneurship" was the first book to present innovation as a purposeful and systematic discipline.

Now in the global context of the 21st century, with the megatrends of demographic change, urbanisation, climate change and migration of the economic centre of the world to Asia, cities and regions compete at a level unknown of before. For European countries, the only sustainable way to compete is to encourage the business sector to develop innovations, and rely on science, technology and knowledge in being able to offer innovative new quality products and services to the markets before anyone else. The success of a city can be measured in how well it responds to and attracts people and businesses in its target markets of investors, visitors and residents.





To become and remain competitive toward these target markets in the 21st century requires the cities to find their unique attraction factors, in competition with other cities on the national and global area, and today this requires work with innovation. However for a city, innovation is a messy business. It's full of blind alleys, random collisions and abrupt changes in direction. Ideas mix and recombine, fail, reemerge and, in the end, a precious few become successful.

Innovation, most of all, is driven by collaboration. So it takes more than just smart people, but diversity as well. Different people, working on different things, colliding together in unexpected ways is what brings about important new ideas. That's why, more than anything else, vibrant cities are crucial to our continued ability to innovate and compete. Therefore we need **innovative ecosystems** - the localized attraction and clustering of talented professionals, smart institutions, frontier research and innovation and leading companies that allows the spark of creativity to bring new innovative developments.

Such environments are rare and historically exceptional. They do not spawn from nothing and it is very difficult, maybe impossible, to create one simply with public action and investment. However, they do exist, and typically the public sector (local, regional, national administration, or research institutions and universities) is a central player in the creation, growth and dynamisation of innovative ecosystems.

Innovative ecosystems - regional attraction and clustering of talented professionals, smart institutions, frontier research and innovation and leading companies - are rare and historically exceptional. They do not spawn from nothing and it is very difficult to create one from a top down perspective simply with public action and investment. However, they do exist, and typically the public sector (local, regional, national administration, or research institutions and universities) is a central player in the creation, growth and dynamisation of innovative ecosystems, with a combined top-down and bottom up-approach.

The modern city, hub of the global economy, must be diverse and accommodate all kinds of knowledgebased economic activities such as low-impact industry or technology services. The preferred urban model is compact, dense, sustainable, and diverse (merging residential, public, commercial, service and production activities); a city that copes better with competition and differentiation, that provides opportunities for talent and that remains solvent and resilient under all circumstances.

The creation and development of Innovative Urban Areas (IUA) and Innovative Ecosystems

is a complex, long and difficult project. They demand coherence and harmony between very diverse but inter-related activities: urban planning, real estate investment and commercialization, science and technology strategies and of programs, attraction leading companies, dynamisation of the ecosystem, political and economic leadership, etc.

For old districts that can be renewed and revitalized, or new areas like Uppsala Campus Ultuna, which can be made available for bold development, cities have the opportunity of creating





IUA that concentrate scientific and business talent in an attractive and lively urban environment by design.

Innovative Urban Areas can be dispersed across a city, or located in one campus. In section 3.4 below we discuss the concept of 3<sup>rd</sup> generation innovation environments where this is explained further.

#### 3.2 Innovative Urban Areas

A constant dialogue between residential, cultural, economic and S & T activities are at the core of the IUA model. A fruitful and coherent dialogue between the physical aspects (urban planning, infrastructure, architecture), the content (companies, R & D centres, universities, incubators, etc.) and the relationship networks is crucial during the design, construction and steady-state phases of the project.

Quality education and training, diverse professional profiles, sustained capital investment, frontier R & D, large and innovative companies, start-ups, diversified economic activity, stable public involvement, rich public-private partnerships, confidence, simple and incentive-compatible regulation, long-term strategic vision, etc., are some of the key elements that have to be created, attracted and developed, with synchronicity and cross-fecundation, to develop a successful and sustainable IUA project.

Some of these key elements are endogenous, other exogenous, some can be acted upon and others are given conditions. However, it is always possible to work thoroughly to provide our companies, research centres and universities with the best tools, talent, infrastructure, meeting and collaboration programs, etc. to foster innovation and to improve their capacity to compete in the world market.

Once upon a time, innovation was an isolationist sport and was possible in "ivory-towers". These ivory-tower achievements of older times look like this to us today as the rate of change was slower back then. Today we cannot see the whole context that existed between towers even at that time. Today, proximity is everything. Across the world, talented people want to work and live in urban places that are walkable, bike-able, connected by transit, and hyper-caffeinated. Major companies across multiple sectors are practicing "open innovation" and want to be close to other firms, research labs, and universities. Entrepreneurs want to start their companies in collaborative spaces, where they can share ideas and have efficient access to everything from legal advice to sophisticated lab equipment.

These disruptive forces are coming to ground in small, primarily urban enclaves called '**innovation districts**'. Innovation districts cluster and connect leading-edge institutions with start-ups and spin-off companies, business incubators, and accelerators in the relentless pursuit of cutting-edge discoveries for the market. Compact, transit-accessible, and highly networked, they grow talent, help exchange of ideas and knowledge, foster open collaboration, and offer mixed-used housing, office, retail, and 21st century urban amenities. They are attracting an eclectic mix of firms in a diverse group of sectors, including life sciences, clean energy, design, and tech.

Unlike efforts to grow the "consumer city" via sports stadia, luxury housing, and high-end retail, innovation districts are intent on growing the firms, networks, and sectors that drive real, broad-based and most importantly sustainable prosperity.

At a time of increasing concerns over inequality and resilience, innovation districts are proven to spur productive, inclusive, and sustainable growth. If properly structured and scaled, they can provide a strong foundation for the commercialization of ideas, the expansion of firms, and the creation and retention of jobs.



### 3.3 Concept for Innovative urban area (IUA)

The development of IUAs and other S & T-focused real estate projects must be based on a good understanding of the opportunities, challenges and capacities of:

- The existing industrial and knowledge assets of the city and region
- The global technology and market trends
- The potential new areas of activity at the interface of existing assets and global trends

A correct selection of the scientific and industrial specialization (clusters) of the new innovative area is crucial for the future success of the initiative. Only a technological specialization based on existing assets will be capable of serving the surrounding industry and of improving the research activity of local R & D institutions and universities. But only a technological specialization that opens new markets and allows benefiting from global trends will have the necessary impact on growth and international competitiveness.

	Common elements of an Innovative Urban Area
Т	Park Hub – Central administration and services
2	R&D and Technology institutions
3	University departments, laboratories and advanced training facilities
4	Project and business incubators
5	Mixed and PPP institutions
6	Auditoriums, meeting areas and interstice areas
7	Public and private promotion office space
8	Public and private land lease/sell for corporate buildings
9	Public and private land lease/sell for soft industrial facilities
10	Hotels and restoration facilities
П	Residential areas
12	Infrastructure (transport, energy, water, ICT, waste, etc.)

One of the European Union's initiatives in Horizon 2020 is **Innovation Union**. It is about the European Union's strategy to create an innovation-friendly environment that makes it easier for great ideas to be turned into products and services that will bring our economies growth and jobs. To create innovative ecosystems the EU has provided a toolbox with Horizon 2020, the new framework program 2014-2020. The ideas on innovative urban areas in this report are well aligned with the EU's initiative.

#### 3.4 Third Generation (3G) innovation environments

Bearing has gained vast experience from projects world-wide within the area of innovation environments. The reward for us in this arena is that we are able to contribute to sustainable growth and globalization of both regions and corporations. By practicing our well-proven Innovation Framework Methodology we help our clients increase their efficiency and maximize their commercial opportunities.



A complement and/or natural enhancement of an existing  $I^{\,st}$  and  $2^{nd}$  generation innovation environment, physical circumstances permitting, is the migration to a  $3^{rd}$  generation innovation environment.

#### 3.4.1 Background to the third generation innovation environments

For fifty years, science (and technology) parks have been exploited as an institutional solution to the problem of technology transfer and related knowledge sharing between R & D institutions and business enterprises. A Science Park is the generic term for "an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions". This is the broad, authorized definition from the International Association of Science Parks (IASP). The term 'science park' may be replaced in the definition by research park, Technology Park or just a managed innovation environment anchored in a local or regional context.

The most resourceful science parks will provide a comprehensive assortment of value-adding services together with high-quality labs, office spaces and other facilities. According to the IASP membership criteria, a science park should facilitate the creation and growth of innovation-based companies, for example through incubation or spin-off processes among existing firms, but also assist in the creation of entirely new firms.

To enable its goals to be met, the science park should also stimulate the flow of technology and related knowledge and knowhow amongst business firms, universities and other R&D institutions, as well as the wider markets. In many instances, strategic partnerships between academic institutions, local and regional governments and the private sector are seen as particularly instrumental.

All over the world, science and technology parks of today tend to 'go urban' to become 'science city areas'. Increasingly, they are moving their activities from park locations outside of the city or in a suburban area. They are coming in from the suburbs and even going into the very centre of a city. This is a major shift of location, caused by practical experiences. Such moves are stimulated also by better analytical insights into the workings of contemporary innovation processes. Location oriented innovation theory has come to recognize the importance of local and regional footprints of global business enterprises.

#### 3.4.2 From science "parks" to urban innovation "clusters"

Science parks and other managed innovation environments are increasingly being perceived as integrated parts of urban clusters and not as independent entities. As in the past decades, each science park, regardless of location, tends to be projected by its management as special and unique. It should be multifaceted through its own, distinctive variety of professional skills and the social capital available in its particular locality, city or region.

Now, at least in Europe's metropolitan regions, the entrepreneurship and the dynamism that drive today's innovation environments come as much from outside the region as from within. More and more, the borders become blurred between a park and the capabilities embedded in the city it is part of. Borders are becoming indistinct also between science, technology and other economic activity on the one hand and areas of living and recreation on the other.

The science park principles and modes of operation may prevail, but the science parks of today seem definitely to be 'going urban'.



#### 3.4.3 Third Generation Science Parks and urban dynamics

The traditional science parks, clearly separated from the urban context into a designated, even detached zone, may surely be effective for some types of innovation, whilst being less effective for other types. "The traditional conception of science parks was based on the assumption that the high-tech component of the economy would have grown faster than the other components of the economy, and in the long run it would have become the larger part of employment and value added. This traditional forecast has somehow failed to consider the transition occurred from an industrial society to a post-industrial society.

Although the manufacturing sector has certainly become more and more knowledge-intensive, and the high-tech industries have become larger at the expense of the low-tech industries, the shift from manufacturing to service industries has substantially changed also the spatial dimension of knowledge generation and distribution.

The Third Generation Science Park management recognizes that 'post-industrial' economic activities need a much closer interaction with the knowledge suppliers and the wide range of services that support the innovative firm. Therefore, a successful local cluster of competencies relies on the capability of the producers of innovation to interact successfully with potential users as well as with many other economic players and not just with the high-tech ones.

These tendencies force the old generations of science parks to transform and to connect better to the wider resource base of the city. From a policy point of view, focus is put on emerging innovation environments, which are designed to be deeply embedded in the urban and regional economic fabrics. On the other hand, there is no simple 'spatial formula' for achieving what could be perceived as a locally (or regionally) 'embedded dynamism' that fosters innovation more effectively.

To provide a background to the third generation of science parks, we will explain the development of the first and second generation.

#### 3.4.4 First Generation Science Parks: "Science Push"

In Europe, the very First Generation Science Parks were founded already in the early 1960s, inspired by Stanford University and other US universities that made it more trouble-free for academics to become entrepreneurs. A First Generation Science Park is an extension of a university into a dedicated neighbouring area that includes incubating facilities for start-up firms, related business services and, as importantly, pathways into new, research-based technology (and know-how) for potential investors and other business persons. If possible, it should operate as a science-based technology zone.

The innovation philosophy of a First Generation Science Park is 'science push'. The many new ideas stemming from research and experimental development (R&D) should be channelled without difficulty to new firms established in or aggregated around the science park.

#### 3.4.5 Second Generation Science Parks: "Market Pull"

The Second Generation Science Parks are somewhat more recent institutions. A Second Generation Science Park or Technopol remains an extension of a university (or other major R&D facility) into a dedicated high-tech zone. However, the drive and the decisive energy come from businesses, interested in the creation and growth of innovation-based companies. Managers of Second Generation Science Parks respond to such business needs by making available a mix of high quality facilities in the Park, by streamlining the flow of technology and related knowledge, and by advancing and combining value-adding business services – from early incubation of new-born firms to a variety of spin-off and spin-on processes of technological significance to already established firms.



The innovation philosophy of a Second Generation Science Park is 'demand pull'. It is market-driven to a higher degree than the First Generation Science Park. A Second Generation Science Park is less concerned with the early exploitation of scientific results and capabilities, than with the final stages of the innovation process. Research results and techno-scientific findings are regarded as 'raw materials' for the innovating firms.

#### 3.4.6 Emerging varieties of contemporary Science Parks

In the current evolution of Science Park generations, a more comprehensive type of park is being tested and implemented, typically located within a vibrant urban community. For some urban planners, the Third Generation Science Park is perceived as the quintessence of science-industry-government relations, increasingly functional and specialized along with its participation in local, regional and even global innovation activities. At the same time, this science park generation is becoming a contradiction in terms, as its management is striving to eradicate the fixed boundaries of the park for it to become a truly embedded catalyst for innovation in the urban spatial context. The park is transformed into a city area or, even, becomes embedded into the existing urban fabric.

Still, like its two predecessors, a well-functioning Third Generation Science Park (or '3G Innovation Environment') is an organization managed by professionals, experts on innovation support. The objective remains to increase the wealth of the community by promoting science industry-government relations in a number of ways. However, a fully-fledged '3G Innovation Environment' offers a more comprehensive blend of innovation-related services simply by tapping directly into available and new innovation support services of the city it is part of. Furthermore, it goes beyond such methods and means to incorporate also the flow of technology and related know-how inside the city as well as in the surrounding urban and regional space. In these local and regional contexts, it tends to serve also as a model of governance for how to foster innovations throughout the broader economy. It answers questions like: how to create and maintain communicative linkages among a broader spectrum of entrepreneurial activities than in the two other science park generations?

As already indicated and underlined, a key difference to the previous science park generations is its urbanized nature that makes the park integrate better into other socio-economic activities, conducive to innovation. In this way the Third Generation Science Park could operate as a 'catalyst' for a range of innovation activities while setting examples for entrepreneurship and influencing the local culture of innovation.

The innovation philosophy of a Third Generation Science Park could be labelled 'interactive innovation'. It is both 'science push' and 'market pull'. It departs from an underlying 'linear model' of innovation, while making more effective use of the network overlay of communications in university-industry-government relations. In a Third Generation Science Park innovations, even those mastered by a single company, may stand out as comprehensive outcomes of these interactive, functional relations.

#### 3.5 Five design elements for creating success

Based on our general experience from many Innovation Environment projects we typically combine a comprehensive set of approaches to create economically, dynamic and environmentally sustainable urban development with elements from 'Third Generation Innovation Environments' and general investment strategies. Also, we have benefitted from our systematic insights into R&D and innovation activity in some of the world's leading-edge labs by our detailed benchmarking exercises at top universities and centres of learning, widely recognized for their educational, training and research facilities.



As a rule of thumb, though with variations from case to case, a conceptual design and implementation strategy of any new sustainable urban area will rest on five major headings. Each of them will be elaborated as 'design elements' or 'success factors'. Ideally, when implemented, the five design elements should overlap and be closely integrated with the area's overall implementation strategy.





#### 3.6 Bearings "A3-model"

As a methodology for our work, we have developed the A3-Model. Every project takes off by performing an alignment phase. This phase comprises a thorough analysis of all key stakeholders expectations, motivation factors and core values. Alignments of these fundamental parameters are imperative in order to successfully perform any regional development program. This phase contain an alignment work shop which aims for the creation of a unified picture that will become the ground for the following phase of developing of a vision and mission statement. Not until this stage is set can the project embark upon the more practical work with the five design elements and organization. The organization must clearly define how responsibilities, authorities and motivation factors are linked and interlinked to the synchronized action plans that will follow.

The A3-model is securing an outside  $\rightarrow$  in perspective which optimizes the conditions of lifting the region to an attractive international place for development and investments. The model also secures the structure, organization, engagement and availability of resources – in both depth and width - necessary to succeed in the creation of an ambitious regional innovation environment.

- Actors, stake holders and instigators in the system
- Assets, innovation capacity and infrastructure in the system
- Activities and innovation processes
- Governance, management, governing and cultural conditions





The Bearing A3-MODEL for development of regional innovation environments



# 4 Actors and capabilities within the bio-based economy in Uppsala (Invärlden)

This part of the feasibility study encompass a mapping and description of the collective resources and capabilities currently located in the geographical area surrounding Ultuna that could constitute important components for developing an internationally leading research - and innovation environment on Campus Ultuna. The mapping includes industry, research and other activities, and in particular the life-science-based R & D and other relevant activities undertaken by the unique combination of actors comprising Uppsala University, SLU and SVA.

The scope of organisations covered by the following description is the result of an initial screening of the organisational landscape and context together with the Campus Ultuna working group. All in all 15 organisations have been "reviewed" as a part of this work. As most of them do not run dedicated activities, or have specific agendas, for the bio-based industry we will not describe them individually as initially planned. Instead we will provide the information focussing on three groups of actors:

- I. Research institutions
- 2. Industry
- 3. Public initiatives and physical environments

The purpose of the mapping is 1) to increase the general level of knowledge about the activities and capacities of the actors in this field, 2) to get indications on which areas that are particularly strong within the field of bio-based economy, 3) to get indications on other strong or weak aspects that may reinforce or hamper the development of Campus Ultuna.

#### 4.1 Research

#### 4.1.1 Sveriges Lantbruksuniversitet, SLU

SLU is one of Sweden's most research-intensive university with a mission to develop knowledge about how human beings can manage and utilize the biological natural resources in a sustainable manner. Education and research at the University range from genes and molecules to biological diversity, animal health, sustainable forestry, food security, community planning and sustainable development of urban and rural as well as global phenomena like climate change and its effects.

SLU is commissioned by the Swedish government to carry out research on agriculture and horticulture, landscaping, food production, nature conservation, forestry and wood raw processing, fisheries and aquaculture and veterinary medicine and domestic animal care. SLU also has a mandate to conduct continuous environmental analysis. SLU's strength as research and educational institution is based on the combination of basic research, education and community related activities.

The work force measured as full-time-equivalents reached almost 3000 in 2013 (whereof approx. 2300 are researchers or technical staff). The total income in 2013 was just over 3 billion SEK.

#### Research

According to the independent evaluation "Kvalitet och Nytta" (KoN 09) SLU has world-leading research groups in Forest Vegetation Ecology, Forest Mycology and Pathology, Animal Breeding and Genetics, wood science and wood fibre, biology, remote sensing, chemical ecology and soil-plant interactions. The strongest area, by far, is plant science, where SLU publications are cited on average



twice the world average. Also according to this evaluation SLU has internationally renowned research with good development potential in areas such as basic bioscience and food.

In the strategy for the period 2013-2016 SLU points out two areas, presented under two main headlines, which will receive particular attention:

I. A bio-based economy, and

Figure:

2. Environment, health and wellbeing

The strategy also states that initiatives in these problem-oriented areas must be based on strong basic biological research. Basic bio science, systems biology and chemistry has therefore a very high priority for SLU. Within the areas SLU has particular competence/focus on the following areas:

A bio-based economy	Environment, health and wellbeing
Innovativt nyttjande av bioråvara för att ersätta fossila råvaror	Ekosystem, miljö och klimat
Livsmedelskedjan	Urbana miljöer och landskapsarkitektur
Effektiva och hållbara produktionssystem inom de areella näringarna	Djurhälsa och djurvälfärd
Akvatiska resurser	Samverkan mellan veterinärmedicin och humanmedicin
Målkonflikter kring naturresurserna	Betydelsen av djur och natur för människans hälsa och välbefinnande
Landsbygdens sociala och ekonomiska utveckling	
Kretslopp mellan stad och land	

SLU is funded with state appropriations to 51 percent and by grant and fee income to 49 percent. Historically, research expenditures based on grants and fees has been dominated by the areas "Biology" and "Plant production". This is illustrated by the figure below.



Receiving research areas for grants and fees. Source: SCB



As illustrated by the figure below, the single most important funding source for SLU, when it comes to grants and fees, is Formas<sup>1</sup>. Compared to many other universities SLU receives significant funding from private actors as well.



Figure: Grants and fees from selected sources. Source: SCB

The largest private contributors to SLUs research is shown by the following table.

Företag	Invoiced income	
	2013	2012
Medivir AB	4 994	I 280
Elforsk AB	2 738	73
Forsmarks kraftgrupp AB	2 700	2 084
Zarkara Genomics AB	2 43 I	I 795
OKG AB	2 180	I 681
RINGHALS AB	I 746	I 555
DeLaval International AB	I 567	I 000
Intervacc AB	I 500	I 500
Biogaia AB	I 300	I 300
Q-med AB	I 205	520
Svensk Kärnbränslehantering AB	I 202	733
Svensk MKB AB	622	I 477
Spiber Technologies AB	516	I 024

<sup>&</sup>lt;sup>1</sup> The Swedish Research Council Formas. It should be noted that the funding sources displayed here only represent parts of the total sources. The total income for grants and fees amounted to just over 900 million SEK in 2013.



#### Technology transfer policies and structures

SLU is a user-oriented university and technology transfer is likely to be an integrated element of a large share of on-going research projects. However, to further promote the valorisation of knowledge from the university SLU Holding was established in 2007. SLU Holding's mission is to generate economic growth and increased community development through commercialization of innovations, products and services from SLU. In 2013 an innovation office (innovationskontor) was established at SLU. The innovation office operates within the framework of SLU Holding and is responsible for delivering information and advisory service to researchers and student looking to valorise their ideas. This has generally strengthened the technology transfer activities at SLU and made it possible for SLU holding will have a staff of 12 people. This includes innovation office advisors also located in Umeå, Alnarp and Skara.

During 2013 an increased interest in officered service has been noticed. In total, 75 new cases were processed (in 2012 44 cases were registered). SLU Holding runs a number of projects and activities to support its mission, e.g. Intellectual Assets Inventory (IAI), funding for verification support together with Uppsala University and entrepreneurship programs targeting women.

SLU Holding's second line of business consists of capital investments in early, research-based companies with growth potential. In 2013, SLU Holding been partners in eleven active companies, three of which have been listed on various marketplaces.

SLU's strategy is to develop its role as a committed player in interaction with stakeholders outside of academia, including new forms of collaboration, training in research communication and efforts to build up new contacts for interaction with the public sector and schools. Some different models for cooperation with external stakeholders are put into practice to realise this ambition, in the following some of the most prominent ones are highlighted.

Co-operation model	Description
Samverkanslektorer	In a unique initiative SLU launched 18 extension appointment (samverkanslektorer) tasked with mission to interact with the community, while also conducting own research in their subject areas. The emphasis in these appointments lies on developing extension processes that are closely integrated with research and teaching in the department/field. Appointees are expected to spend 50 per cent of their time on extension activities in receipt of direct government funding. Extension appointees must also have a sound knowledge of associated research fields so as to be able to act as an entry point to SLU activities in other areas for a broader category of stakeholders.
Temaforskningsprogram	The Faculty of Natural Resources and Agricultural Sciences runs five thematic research programmes. These programmes are jointly funded by SLU and industry and operate in the following areas: food, bioenergy, soil mapping, environmental effects of stump harvest and biomass production of Salix: <i>BarleyFunFood</i> is a thematic research program in which the Faculty of Natural Resources and Agricultural Sciences, SLU is collaborating with the agro-industrial sector (Lantmännen Food R&D and SW Seed, Svalöf Weibull AB) in order to increase our understanding of barley biology and nutritional effects of cereal carbohydrates.
	<i>BioSoM</i> ( <i>Biological Soil Mapping</i> ) is a thematic research program, aiming to give scientific support towards a new service to farmers detecting soil borne pathogens and advising in crop management to optimize production in Sweden. Industrial participation: Eurofins Food & Agro, Scanbi Diagnostic AB, Findus R&D, HS Konsult AB, Lantmännen SW.



crothrust (Mucrobially Derived Energy) sime to develop production processes
biofuels as well as biochemicals and food/feed from forestry and agricultural mass with maximal energy and economic output and minimal environmental bact. The program was initiated and funded by the Faculty of Natural ources and Agricultural Sciences, SLU (50 % funding), the National Energy ard, the Swedish farmers Research Foundation (SLF), Medipharm AB, ngenta Seeds, Tekniska Verken Linköping/ Svensk Biogas AB, Jäst-bolaget AB, ematur Engineering AB, Sala-Heby Energi AB and Danisco/Genencor AS.
e stumps as biofuel. In this program, research is carried out to create a basis better guidance on where and how stump harvesting may be conducted in ation to environmental goals. The programme is supported by The Swedish ergy Agency and nine FSC-affiliated organisations that are actors in Swedish estry (SCA, Sveaskog, Södra, Holmen, Bergvik, StoraEnso, Skogssällskapet, erudKorsnäs, Svenska Kyrkan)
MBA. The research project "Salix Molecular Breeding Actions" – SAMBA2 started in December 2011. It is a collaboration between The Faculty of tural Resources and Agricultural Sciences at SLU and the company ntmännen Lantbruk. The project is financed by the Swedish Energy Agency, J and Lantmännen SW Seed. It runs with a total budget of 24.9 million SEK 011-2015).
therskap Alnarp started in autumn 2004 and is a partnership organization olving the SLU LTV faculty (Landscape Architecture, Horticulture and Crop oduction Science), industry, government, and industry associations in othern Sweden. Partnership Alnarp aims at: 1) through project development, wacity building and research information, strengthen the competitiveness of e agricultural sciences and related industries 2) create a platform where oject ideas and other collaboration opportunities can be discussed and oblemented. rrently Partnership Alnarp has over 80 members representing various mpanies and organizations that have signed agreements with SLU Alnarp for eriod of three years. Members pay an annual fee that funds the partnership ivities. For specific projects the faculty contributes with five million for 2014, ich will met matched by financing from external funding. There are plans to

#### Research equipment

The four faculties of SLU have made an inventory of research equipment, infrastructure and resources (core facilities) that are at hand in the university. The purpose has been both to create internal transparency and to raise knowledge of what resources that could be made available also to external stakeholders. The list of core facilities is quite extensive and comprise in particular a large number of accredited laboratories with specific instruments and field trial facilities (both for plant and animal research but also research vessels and biobanks. The inventory is quite recent (early 2014) and is therefore probably quite comprehensive. Terms for access and utilisation is however not specified but needs to be negotiated on individual basis.

#### 4.1.2 Uppsala University

Uppsala University is the oldest university in the Nordic countries and one of the major academic and research institutions world-wide. There are 40,000 students studying in Uppsala and the University is characterized by diversity and breadth, with international frontline research at nine faculties and a multitude of educational offerings at undergraduate and master levels. There are three disciplinary domains: Arts and Social Sciences, Medicine and Pharmacy, and Science and Technology.



University turnover is close to six billion SEK and the number of employees equals roughly 5.600 full time employees of which approx. 2100 are teachers/researchers. The spending on research and PhD studies amounted to SEK 3,9 billion SEK (67% of total spending) in 2013. Roughly half of research is funded by external sources.

#### Bioeconomy-related research

Uppsala University is a major player in the field of research and education and excels in a number of disciplines. It has during the last number of years, with only a few exceptions, been placed among the 100 best universities in the world in the three largest international rankings: Times Higher Education (THE), QS World University Rankings and Academic Ranking of World Universities (ARWU/Shanghai).

Research excellence is also found in disciplines relevant for the bioeconomy although it is sometimes difficult to pinpoint exactly to what extent different faculties and departments that are dedicated to bioeconomy-related questions. Generally speaking, however, the following faculties and departments are highly relevant to the bioeconomy sector:

- Faculty of Medicine
- Faculty of Pharmacy
- Centres within the medical and pharmaceutical areas
- Chemistry
- Biology
- Earth Sciences

Within this study we have not carried out a detailed analysis if the research capacities of the listed faculties and departments but we can nevertheless conclude that also Uppsala University is a major player ehen it comes to knowledge production relevant to the bioeconomy. The emphasis on research is, however, in the biomedical field and not the least zoonotic, antibiotic resistance and lifestyle-related illnesses (*folkhälsosjukdomar*).

#### Technology transfer policies and structures

Uppsala University Innovation (UU Innovation) is Uppsala University's unit for developing collaborations between research and industry.

UU Innovation's mission is to strengthen the university's research and education through increased interaction with the surrounding society, above all with industry. Of particular importance is to establish "strategic alliances" between the university and industry and in connection with this develop models for organization and agreements for multidisciplinary research with other universities and/or companies. UU Innovation shall also support individual researchers and students, examine prior art and give patents and intellectual property advise, assist in contract writing, and assist in contacts with relevant authorities and companies. Last but not least UU Innovation shall be the university's interface with UUAB Holding and its daughter companies, through which the commercialization work takes place

Wave power, new materials, solar cells, cancer vaccines, robots, smart windows, machine translation, 3D optics, positron emission tomography, micro motors are a few examples of concepts and products which have grown from research at Uppsala University in the last ten years.



UU Innovation has designed and is implementing a number of models and projects to foster collaboration between the university and different stakeholder groups. Here two examples are outlined:

#### 1. The Ångström Material Academy (ÅMA)

ÅMA is a strategic research platform led by UU Innovation. ÅMA's task is to provide a link between the materials research carried out at the Ångström Laboratory and industry, with the aim of spreading more of the knowledge emanating from academic research into society. ÅMA arranges workshops, conference days and lunch seminars – meeting places for researchers and industry representatives. This enables new cross-disciplinary collaborations between academy and industry.

#### 2. SciLife Innovation

SciLife Innovation is a pilot project that enables businesses to be part of the vibrant environment of cutting-edge research that is SciLifeLab. SciLife Innovation is also an opportunity for researchers in SciLifeLab to make business contacts and thus bring in new knowledge and technology for their own research. SciLife Innovation has been initiated by UU Innovation and the Karolinska Institute's Innovation Office and aims to develop partnership models in which an important part is concrete cooperation between industry and researchers in SciLifeLab.

Within the framework of UU Innovation, Uppsala University AB Holding (UUAB holding) is acting. UUAB Holding is the university's holding company. Through UUAB Holding the university can license out new technology and establish new research-based companies. UUAB Holding may, for example, be involved when a researcher wants to start a company and may provide help in matters of business law and patent support, and even help with some early seed capital. Typically UUAB contributes 100,000-500,000 SEK (in some cases up to 1 million SEK) in return for 3-15% of the company's shares.

Since 1996, UUAB Holding has assisted in the launch of nearly 60 companies, most of which operate today. Presently UUAB Holding holds shares in some 35 companies.

#### 4.1.3 The National Veterinary Institute, SVA

The National Veterinary Institute, SVA, is a Swedish national authority that strives to promote human and animal health, Swedish animal husbandry and the environment through diagnostics, research & development, monitoring & readiness (of and towards diseases) and communication & advice.

In diagnostics, SVA is the only comprehensive veterinary lab nationally and performs close to 575 000 analyses each year. SVA has a diversified service portfolio with expertise in virology, parasitology, bacteriology, pathology, chemistry and feed. A large proportion of the samples sent to SVA are saved and re-used in research and as a basis for statistics.

Research at SVA aims at strengthening the knowledge base to improve and develop new and more effective methods of diagnosis and disease control and assure a better understanding of the mechanisms of occurrence and spread of diseases. This is turn is e prerequisite for an effective response to fight communicable infectious diseases.

A key task of SVA is to help Sweden in maintaining a high readiness to manage epizooties, zoonosis, and antibiotic resistance. SVA is national epizooty-body and a zoonosis center. SVA maintains a



permanent on-duty epizootologist that veterinarians can contact if they suspect serious infectious disease.  $^{2}\,$ 

As for advisory services SVA has a significant breadth and depth of veterinary expertise. SVA works with extensive advisory services including: education, risk analyses, reports, expert participation and sharing of knowledge through its web-site.

#### Activities

The turnover of SVA was approximately 384 million SEK in 2013. Operations were funded to 30% by government appropriations, to 42% by service fees and to 28% by grants. The average number of employees was 399.

It should be noted that the majority of fees in 2013 consists of revenues from vaccine sales. Revenues are coupled to the corresponding costs for vaccine purchase and occurs through SVA's role as a wholesaler of veterinary vaccines. From autumn 2013 SVA has restricted its wholesale operations to farm animals and to epizootic diseases as required by law. The overall

This said the distribution of appropriations, fees and grants vary significantly between different areas of activity, the overall picture is shown in the figure right and the following paragraphs highlights the situation for each activity area. All information has been retrieved from the 2013 SVA annual report.





<sup>&</sup>lt;sup>2</sup> An epizooty is a serious infectious animal disease and a zoonosis are serious diseases that can be transmitted between animals and humans.



The number of diagnostic assignment at SVA varies over the years, which among other things is related to current disease situation and strategic decisions about follow-up and monitoring. The largest number of diagnostic tests at SVA is done in comprised by virological and bacteriological analyzes. Authorities, in particular the Swedish Board of Agriculture, are the largest commissioner of diagnostics at SVA. Examples of other major customers include *Svenska djurhälsovården, Växa Sverige, Svensk fågel* and *Quality genetics*. The assignments for these customers often have connections to the control and monitoring program. In addition, SVA also carry out assignments for animal hospitals, veterinary clinics and individual pet owners.

The costs of disease monitoring and readiness is influenced by disease location and current threats. The costs have increased in recent years as dis revenues. The main reason for this is problems with infections that can be transmitted between animals and humans (zoonoses), the risk of introduction of new diseases and the threat of bioterrorism, which resulted in that SVA received grants from, among other, the Swedish Board of Agriculture and MSB – Swedish Civil Contingencies Agency.

The scope of SVA's research and development activities varies slightly from year to year. In recent years, the research share of SVA's total cost volume was around 14 percent. In 2013 almost half of the costs were financed through external sources. External funds are obtained mainly from government funding agencies and the European Union but also from various professional organizations. SVA's researchers participated in 2013 in seven different EU-funded research projects and was co-authored 69 research articles in which at least one party was from another country than Sweden.



for disease monitoring and readiness

SVA R&D is focused on a few areas. A key topic is how different agents spread between animal and humans and how new infections occur (including research on antibiotic resistance). Within the research Network One Health Sweden (formerly Infection Ecology and Epidemiology), SVA cooperates since three years with Uppsala University, SLU and the Linnaeus University in Kalmar. One Health Sweden is a collaboration platform for researchers with interest in



zoonotic infections. One Health Sweden connects several universities and governmental organizations that wish to contribute to a sustainable intellectual platform where veterinarians, physicians, molecular



biologists, ecologists and environmental chemists with an interest in zoonotic infections can interact and create synergies. For more information see http://www.onehealth.se.

#### Technology transfer policy and structures

SVA is not an academic actor although much of the services provided are based on research knowledge or dependent on research results. SVA provides services with a very specific mission and the entire portfolio of offerings can, generally speaking, be characterised as technology transfer. The main instrument for this is through selling or provision of research, diagnostics, analyses, etc. to public and to private stakeholders.

SVA does not have a formal policy for managing the commercialisation of knowledge or results stemming from its activities where it has freedom of action. That results with a potential, or factual, value for users may occur is likely and has happened in the past. It is even probable that this may be even more frequent in the future due to rapid technological development, Historically, when this has happened, a spin-out company has been established. Boehringer Ingelheim Svanova, which is briefly described elsewhere in this report is one example of this. As said, however, SVA is not systematically fostering such processes (but not obstructing them either).

#### Research and laboratory equipment

The animal House has 25 animal rooms where mostly studies on mice, poultry and rabbits are carried out but also with larger animals such as pigs and calves. Also studies with other species have occurred at rare occasions. SVA's animal house is the only one in the Uppsala region where one can perform infection experiments - currently at the highest biosafety level 2 (Bsl 2) Clients include, besides SVA, external actors such as universities, biotech companies and other agencies. Examples of R&D areas are: infection studies with associated resistance emergence, basic immunology and vaccine research, inflammation mechanisms, cancer, neurodevelopmental disorders and diseases that affect food intake.

Currently, SVA has agreements with three biotech companies. During the past three years some five companies had contracts with SVA to use the facilities.

#### 4.2 Industry

#### 4.2.1 Basic facts

The bio-based industry in Uppsala is not easy to capture. When looking at statistics based on a specific set of NACE-codes available for the region Uppsala one can conclude that the bio-based industry is one of the smallest sectors in the region in terms of employment, turnover and value-added. This is made clear by the table below.



	Anställda	Omsättning (tkr)	Förädlingsvärde (tkr)	Produktivitet (tkr)
Besöksnäring	2596	2 776 770	1 075 927	414
Företagstjänster	5617	5 444 765	3 050 310	543
Wellness	1165	1 306 260	438 132	376
Miljö och energi	3117	9 788 104	3 420 938	1098
Byggnads	6983	10 592 922	3 709 775	531
Gröna näringar	713	999 146	379 203	532
ICT	1895	2 672 031	1 341 065	708
Life Science	5456	19 534 255	9 633 528	1766
Transport/logistik	3157	4 517 000	1 746 289	553
Utbildning	648	477 768	259 169	400
Tillverkning	7254	16 990 920	5 318 192	733
Högteknologi	2668	4 435 930	1 814 156	680
Kreativ sektor	1177	1 761 763	576 525	490
Handel	7133	23 736 291	3 843 755	539

Source: Kontigo & Regionförbundet Uppsala

When it comes to the development of the sector, in terms of value-added and employment, in the past years the bio-based industry finds itself in the mid-field. This is illustrated in the figure below.



However, as the above statistics only include companies above a certain size the picture may not be altogether correct. Statistics provided by the Federation of Swedish Farmers – LRF the actual number of employed in the bio-based industry in Uppsala region is approx. 4.800 and the added-value 2,8 billion



SEK. The reason for this discrepancy is likely to be the very high number of very small companies which are not captured by official statistics.

#### 4.2.2 New bio-based companies

For the development of Campus Ultuna all companies belonging to the traditional bio-economy are of high importance. They are the main recipients of knowledge produced within organisations such as SVA and SLU and they are the back-bone of employment and added-value. The dynamics of the traditional sector is not top-level however, i.e. it is not the traditional companies that will contribute to the future "leaps" in employment or added-value. For this other types of companies are necessary. In the feasibility study we have tried to identify such companies using the following starting points:

- I. Companies or projects that have received support from Uppsala Innovation Centre
- 2. Companies located in the Campus Ultuna area
- 3. SLU Holding portfolio companies
- 4. Companies located in other business parks

This methodology is by no means perfect when it comes to capturing the "new" generation of biobased companies. It is particularly difficult, and presumably not necessary, to make delimitations between companies developing pharmaceuticals for human and for animal usage or companies offering analysis tools. This said our mapping has come up with some 45 companies that have been classified as according to the main application area of their products or services. The below figure illustrates this.<sup>3</sup>





#### 4.2.3 Important industrial actors

A few established companies in Uppsala can be considered to be role models and/or locomotives for the development of Campus Ultuna have been identified and are briefly described in the following.

<sup>&</sup>lt;sup>3</sup> It should be noted that most of these companies are very small or even incorporated research projects.



Company	No. of employees	Turnover (MSEK)
SMP Svensk Maskinprovning	60	60
JTI - Swedish Institute of Agricultural and Environmental Engineering	46	43
Novavax	24	18
Kruuse	21	230
Boehringer Ingelheim Svanova	20-49	
Lantmännen BioAgri		17
Incotec	7	10

#### SMP Svensk Maskinprovning

SMP offers a number of services within the areas of machine- product- and environmental safety. SMP is accredited for inspection and SMP offers tailored tests, training-programmes and safety-inspections. SMP has approx. 60 employees and a turn-over of approx. 60 MSEK. It is an affiliated company to SP Technical Research Institute of Sweden. The SP-group employs approx. I 200 persons hand has a turn-over of I 200 MSEK.

#### JTI - Swedish Institute of Agricultural and Environmental Engineering

JTI is an industrial research institute engaged in research, development and information in the areas of agricultural engineering and environmental technology. JTI conducts qualified and independent pilot studies, investigations and evaluations. JTI commands a broad-based skills set and include experts within a number of areas such as Animal production, Bioenergy, Biological waste management and biogas production, Energy and resource efficiency, Handling of nutrients and organic residuals, etc. JTI also offers access to a number of specially equipped facilities, laboratories and methods.

Like SMP JTI is a subsidiary of SP Technical Research Institute of Sweden (SP).

#### Novavax

Novavax AB (formerly Isconova) has its origin at the Swedish University of Agricultural Science (SLU) in Uppsala, where the ISCOM technology was invented by Professor Bror Morein and further developed by him and his and co-workers in the mid-1980s. More than 450 scientific publications from all around the world have since established a wide variety of attributes related to adjuvants based on ISCOM technology, especially their immunological properties. Novavax AB was founded in 1999 as a spin-off from SLU to further develop its ISCOM technology and make it commercially available as a platform for vaccine development and improved off-the-shelf research adjuvants.<sup>4</sup> Presently the company is developing a portfolio of vaccine candidates targeting seasonal and pandemic influenza (H5N1), a vaccine designed to protect children and the elderly against respiratory syncytial virus (RSV), rabies and other candidates.

<sup>&</sup>lt;sup>4</sup> The source of this paragraph is http://www.crunchbase.com/



#### Kruuse

JØRGEN KRUUSE A/S is a 100% family owned Danish company that started in 1896 and has its headquarters in Langeskov in the centre of Denmark. KRUUSE is a global supplier of veterinary equipment and employ more than 250 people in Denmark, Sweden, Norway, U.K., Poland and China.

In addition, KRUUSE has subsidiary companies and own distribution operation to veterinary clinics and pet shops in Denmark, Sweden, Norway, U.K. and Poland.

#### Boehringer Ingelheim Svanova

Svanova has its origin in activities in the Swedish Veterinary Institute (SVA) where veterinary diagnostic solutions for eradication programs and disease monitoring were pioneered – test kits to detect antibodies against virus, bacteria, parasites and mycoplasmas in various animal species, but with the main focus on Bovine and Porcine. In 2001 it was decided to move the activities into a separate business outside the Veterinary Institute and the company Svanova Biotech AB was formed. In 2011 Svanova became part of the Boehringer Ingelheim Animal Health organisation.

#### Lantmännen BioAgri

Since its establishment in 1996, Lantmännen BioAgri AB's business concept has been to develop and sell products based on micro-organisms for biological control and plant growth stimulation within the agricultural sector. The first product developed was called Cedomon. Cedomon is a biopesticide that fights diseases in barley and oats. The other product developed, Cerall has been adapted for the treatment of wheat.

Lantmännen BioAgri AB is owned primarily by Lantmännen. Lantmännen is one of the Nordic area's largest Groups within food, energy, machinery and agriculture. The Group, owned by 33,500 Swedish farmers, operates in 22 countries, has about 8,600 employees and a turnover of SEK 36.5 billion

#### Incotec

Incotec, a Dutch company, provides products and services for seed coating, pelleting, seed enhancement and analytical services for genetic analysis and quality inspection. Incotec's products enhance and improve seed and the company performs analytical testing services for the breeders and traders in the seed industry.

Incotec Sweden AB is located on the Ultuna area and employs seven staff (as of 2013). It not a major company in terms of employees but it is a part of a global player and a fine example of how original SLU research results, after many turns, end up with having a global company located on the campus area. Incotec Sweden markets and sells a seed protection technology called TheromSeed. ThermoSeed is a seed disinfection treatment that originates from research carried out at SLU. It was patented in 1998 and aquired in two stages (2008 and 2010) by Incotech, although Lantmännen BioAgri still holds the rights for the Baltic Sea region. An international launch was started in 2012.

#### 4.3 Existing business parks and real estate configuration

#### 4.3.1 Campus Ultuna in a growing Uppsala

Despite Uppsala growing fast little new office space has being developed over the last 20 years. The focus has been on residential developments and across the city; in Östra Salabacke, Gränby, Börje Tull/Librobäck, Rosendahl, Ulleråker and Bäcklösa new, mainly residential developments are on-going or will be started in the near future. Demand is forecast to remain strong and more residential



developments will be needed, especially since the city is planning for a future population of 350'000 (today ca 200.005). Next to the old Pharmacia plant (todays Uppsala Business Park) land has been set aside mainly for light industrial and logistics, and around Gränby new retail space will be added, as well as a new multi-arena. Atrium Ljungberg intends to develop Gränby as the 2nd city centre of Uppsala However, no specific areas have been set aside for future office development.



- I. Uppsala CBD
- 2. Uppsala Science Park
- 3. Uppsala Business Park
- 4. Ultuna
- 5. Academic Hospital
- 6. BMC
- 7. Ångström laboratory

In today's Uppsala small companies and starts up looking for space, especially with ties to Academia have gravitated to Uppsala Science Park (owned by Vasakronan) whilst larger companies, primarily in the life science sector have gone to Uppsala Business Park. These two areas are today mainly fully, that said both have the potential to expand, especially Uppsala Business Park, which is located next to land that can be developed.

- Ca 70 companies have located in Uppsala Business Park and according to the owner, Klövern, there is strong demand for space in the area, why Klövern are looking at ways to expand the area
- There are cirka 140 companies located in Uppsala Science Park, mainly with a focus on life science, biotechnology, material science, medicin and IT. The Rudbeck laboratory and the Swedish Medical Products Agency are also located in the area.

#### 4.3.2 Uppsala Brand

For Campus Uppsala to become a success it needs to branded and marketed, and this needs to tie in with the branding of the city of Uppsala, and be done not in competition but jointly with Uppsala Business and Science Park.

Here the city of Uppsala will be the important player. Due to its historical legacy, and with several also internationally well know people with ties to Uppsala, such as Carl von Linné, Anders Celsius, Emanuel Swedenborg, Dag Hammarsköljd, Ingmar Bergman, several Nobel prize winners and others, Uppsala is well known internationally. Despite this Uppsala has not been marketed as a business location on its own, rather, to the extent it has been done, it has been done together with Stockholm. The closeness to Stockholm is a fact and a strength, but with a joint branding of Uppsala and Stockholm, Campus Ultuna will struggle for visibility. For Campus Ultuna to reach its full potential it needs to be marketed as part of al Uppsala (only) offering.



#### 4.3.3 Real estate Configuration

Developing an area like Ultuna, for it to be a success it is not enough for it to be a strong demand for space, the rent the prospective tenants are willing to pay must (on average) justify the costs for new developments, not just covering the costs (+ margin) of maintaining the existing buildings. This is the case in Uppsala Science Park. Despite being ca 20 minutes walking distance from the city centre, office rents are amongst the highest in Uppsala. This is unusual and is due in the case of Uppsala Science Park to a combination of (office)space that is somewhat unique in its configuration, and the brand "Uppsala Science Park"

Segment /location	Rent, (kr/m²)	Yield (%)	Uppsala Real Estate market*
Office			
А	1.100 - 2.500	5,25 - 6,75	
В	900 - 1.600	6,00 - 7,50	B B B B B B B B B B B B B B B B B B B
С	700 - 1.100	6,25 - 7,75	A Strategy war
Retail			and the second s
А	2.200 - 4.500	4,75 - 6,00	and the second of the second o
В	800 - 3.600	5,25 - 7,00	
С	700 - 1.200	6,50 - 7,50	and the second s
Industry / logistics			
А	550 - 1.000	6,00 - 7,50	and B
В	450 - 750	6,50 - 8,00	
С	350- 550	7,00 - 8,25	
Residential			Lägesindelning, kontor (A- och B-läge) *) Soure: NAI Svefa
А	1.000 - 1.600	3,25 - 4,50	A = A location (prime)
В	1.000 - 1.400	3,25 - 5,50	<b>B</b> = B location (secondary)
С	1.000 - 1.400	5,25 - 6,75	
			<b>C</b> = C location (tertiary)

Branding of areas and buildings is not unknown within the real estate industry and when successful usually means that premium rents can be achieved in areas or buildings that otherwise do not stand out.

Hence the branding of Campus Ultuna will be important not only then to attract tenants but to achieve a rent that makes new developments profitable.

In Ultuna office rents today should be ca 1.100 Skr/sqm for larger premises and up to ca 1.300 Skr/sqm for smaller spaces. For newly built (offices) rents of 1500 Skr/sqm should be achievable, but would still be too low. A target office rent for Ultuna should be 2.000 Skr/sqm. For this to happen Ultuna would,



in an Uppsala property market perspective, be a B+ location. This is doable, but will require a long term effort to develop the location and the brand of Campus Ultuna. It also has to be done in close collaboration and as an integrated part of the development of South Uppsala.

#### 4.3.4 The (Real Estate) potential

Uppsala is built like Stockholm, around the car. Suburbs developed in the 50s, 60s and 70s (like Norby, Valsätra, Gottsunda and Sunnersta) where located some distance south of the inner city. From the south of Sunnersta it is ca 9 km to the centre of town. These areas are entirely dominated by residential. The only significant commercial building is the Gottsunda shopping mall. This represents the old way of buildings cities, how cities where built when they where built around the car. Today cities are again being built as they used to be, when possible, with everything within walking distance, i.e. residential, shopping, sports, culture, public services and offices in close proximity.

There will be significant new developments in south Uppsala. Although the plans extend until 2050, taken together new residential and commercial space being planned are of similar volumes to those in Norra Djurgårdsstaden, with e.g. up to 30.000+ new apartments and houses being constructed. This make South Uppsala, where Ultuna is centrally located, one of the biggest property development areas in Sweden.

When these developments are completed there will in South Uppsala (Norby, Ulleråker, Rosendal, Valsätra, Gottsunda, Sunnersta, Bergsbrunna, Nåntuna and Sävja) live up to 100.000 people by 2050. In this area there are at present almost no private job opportunities. This could mean that a large amount of people will need to communicate locally and to Stockholm every day.



Comment: The height of the staple indicates the amount of commercial space in the neighbourhood. The blue colour indicate industrial premises, whilst red and green are retail and office space in either commercial buildings (red) or (mainly) residential buildings (green).



This means that there is a large need for more job opportunities in South Uppsala, and the only larger area suitable is Ultuna. Developing South Uppsala maximizing the value of each plot of land would mean developing the whole area for residential purposes (only). However, by optimizing the bits the whole will be sub-optimized.

That said, Ultuna is large enough to become a significant area for academia, for corporates and to some extent housing. A benefit Ultuna has going forward, is that it is one of the few places in Uppsala where tall buildings can be constructed, this being impossible in most other locations, as it would disturb the famous Uppsala silhouette.

For this to happen Campus Ultuna and the wider Ultuna area has to be developed together with and as a closely integrated part of the new South Uppsala. With all the ingredients in place it will be possible to develop Campus Ultuna as a world-class location for living and working, to make it into a true Innovative Urban Area.

According to the Brooking Institute Report (May 2014) "The rise of Innovation Districts" what it takes to ensure success is engagement from; the Mayor and the local Government, from mayor real estate developers and land owners, from managers of research campuses, anchor companies, advanced research institutions and medical campuses, civil society, incubators and social networking programmers. All this is in place in Uppsala and Ultuna.

#### 4.4 Innovation support (extra university)

In this study we have opted to include descriptions of the intra-organisational innovation supporting structures and entities within the frame of the presentations of the respective organisation. I.e. SLU Holding is presented together with other information on SLU. This makes some sense as we want to highlight specifically resources that are dedicated the bioeconomy sector but may, wrongfully, cause the impression that there is no or little collaboration between innovation supporting actors.

In fact, Uppsala has a comprehensive, well-co-ordinated and internationally acknowledged publicly funded innovation support system comprising actors able to help most types of entrepreneurs in most stages of their ideas. Here basic information on a few of the main actors is provided.

It can be concluded that the bulk of resources of the public innovation support available in Uppsala is geared towards the life science sector. No such innovation support (with a few project-based exceptions) are dedicated to the bioeconomy sector.

#### 4.4.1 STUNS

STUNS is a foundation for cooperation between the universities of Uppsala, business and society stuns initiated in 1983. The Board consists of senior representatives of the University of Uppsala, SLU - Swedish University of Agriculture, The Chamber of Commerce, Länsstyrelsen i Uppsala län, Landstinget I Uppsala län, Regionförbundet Uppsala län och Uppsala kommun. By tradition, STUNS is chaired by the Governor of Uppsala County Board.

STUNS brings together decision-makers in the Uppsala region around common topic at the intersection of academia, industry and society. Stuns initiates and implements activities and projects within three strategic areas; 1) Life science, 2) Innovation and business, and 3) Energy.

A major task of STUNS is supporting the development of business in new areas. The goal is to increase the number of innovative and entrepreneurial companies with the potential to compete in the world market. The mission is to contribute to the region's growth and attractiveness through competitive and growing businesses



STUNS is the principal of Uppsala BIO as well as of STUNS Energy and is a shareholder in the business incubator UIC.

#### 4.4.2 UppsalaBIO

Uppsala BIO's role is to bring together academy, industry, healthcare, and local authorities in a common strategy and plan of action in order to strengthen the life science sector's competitiveness. More specific Uppsala BIO ensures a holistic perspective and offers a neutral meeting place and implements programs that improves the life science sector's conditions for growth.

Uppsala BIO offers a range of programs and activities to strengthen the long term competitiveness of life science in Uppsala including:

- Verify:takes ideas into proof-of-concept.
- Commercialize supports the company creation phase.
- Grow supports the development of young and mature companies.
- Network broadens professional contact networks, virtually and in real life.
- Educate provides programs to make the right competencies available, in the short and the long run.
- Reach Out markets our life science sector, locally and globally.

#### 4.4.3 UIC

The business incubator Uppsala Innovation Centre (UIC) has a central role in the regional innovation environment when it comes to securing the inflow of new entrepreneurial businesses. UIC is open to all knowledge based businesses and just over a third of supported companies has its origin in the universities. Equally many are spin-offs from existing industry. The rest comes from the public sector or have founders who do not fall into any of these categories. The dominant sector is life science with over 40 percent of all cases. About 10 percent of companies in the UIC has been formed outside the region.

Since 2006 UIC is owned by four equal partners: Almi Uppsala (since 2013 the municipality of Uppsala), SLU Holding, Uppsala University Utveckling AB and Stuns. UIC has cooperation agreements with Uppsala BIO, Innovation Akademiska and Uppsala University Innovation, and with Östhammars municipality.

UIC is considered one of the most successful business incubators in Sweden. One explanation for UIC's success is the support provided by experienced business coaches in a two-year Accelerator Program. Companies pay a market fee for the business coach's time. Another important success factor is that UIC does not take ownership stakes in the companies. The incubator does not rent or manage premises, but is fully concentrated on business development in companies.



## 5 The external world (Omvärlden)

#### 5.1 Benchmarking summary

The feasibility study contains an international outlook at a number of regions that have developed successful research and innovation environments in the past years. The full benchmark report is available as a separate appendix to this report. Here a summary of observations and conclusions is provided.

#### 5.1.1 Introduction

Key features of a bio-based economy include green business development, research, and appropriate economic incentives and policies. The idea of a bio-based economy is receiving increasing interest as a way towards a more resource efficient and greener growth. The recession that began in 2008 has shown the importance of this particular sector, especially given the fact that traditional industries have suffered badly from the severe downturn. Countries around the world are increasingly investing in this sector, with particular emphasis on the industrial and agricultural applications of biotechnology. The life sciences industry, and even more so the biotechnology industry, is instrumental for the bioeconomy as it is a knowledge and R&D intensive industry in which new products and innovations develop at the interface between electronics, information technology, biomedicine, and drug discovery.

We have decided to benchmark Uppsala with one city with a well-developed biotechnology sector, one world-class university and research centre in the field of agricultural science, and five science parks that are on the list of major biotechnology science parks in Europe. These benchmarks include Barcelona city Biotechnology Sector, Wageningen University and Research Centre, Agropolis International Science Park, Copenhagen Bio Science Park, Innovation Science Park Aston, Area Science Park and Ideon Science Park.

#### 5.1.2 Case #1 - Barcelona biotechnology sector

The biotechnology sector is one of the key sectors for Barcelona and Catalonia- the region that accounts for one fifth of all Spain's biotech companies. In Catalonia, there is a unique form of interaction between hospitals, universities, research centres and industry in general, covering all areas from basic to clinical research and contributing to the growth of the biotech sector.

A well-developed biotech sector in Barcelona is the merit of Barcelona City Council. The Council has been promoting innovation in biotechnology via a series of action plans: through its development agency Barcelona Activa, via initiatives created by its innovation district 22@Barcelona, and through its employment support programmes, besides the coordinated actions of its management at the Council's Department of Economics, Business and Employment. These are aimed at highlighting the value of science and Catalan innovation while promoting the creation and growth of companies involved in biotechnology, biomedicine and medical technology.

Besides promoting innovation in biotechnology, Barcelona is a fine example of a city that seeks development on many levels, with an emphasis on urban, economic and social innovation. Urban innovation includes building a new compact city, where the most innovative companies co-exist with research, training and tech transfer centres, housing facilities and green areas. The city facilitates economic innovation by connecting technologically advanced companies, universities, training centres and research centres, and creating spaces for the interaction and collaboration of these companies to increase productivity. Social innovation includes creation of new networks of formal and informal



relationship fostering the creation of local and international business cooperation projects to improve the social and business cohesion and increasing the quality of life and work in the city.

This innovative regeneration of Barcelona has created new employment, housing and live-work spaces through five knowledge-intensive clusters: Information and Computer Technology (ICT), Media, Bio-Medical, Energy, and Design. The proximity of these clusters to each other fosters interaction among them and the proximity of the clusters to the city centre creates opportunities for results to be shared on a larger scale.

The above-mentioned synergy, interaction and innovation, are the main drivers responsible for already developed and growing biotech sector in Barcelona.

#### 5.1.3 Case #2 - Wageningen University and Research Centre

Wageningen University and Research Centre (Wageningen UR) is a unique alliance between Wageningen University and a private non-profit research institute (DLO foundation) with experienced and highly motivated personnel specializing in strategic and applied research for industry and public institutions. It is a knowledge centre that combines fundamental and applied research with innovative education in the areas of food, agro-technology, production systems, nature and the environment. Wageningen UR trains specialists in life sciences and focuses its research on scientific, social and commercial problems in the field of life sciences and natural resources.

At Wageningen UR, technology transfer is considered to be very important for increasing the innovation potential of the food industry in Europe. One of Wageningen University and Research Centre missions is to develop and disseminate innovative technologies by converting ideas into patented, licensable inventions. Wageningen UR's portfolio covers a range of technology fields, with unique inventions that offer opportunities for applications to solve specific problems or generate new business.

The University offers its technologies to build collaborations with companies or any other organisation/institution willing to develop further novel and innovative applications for the benefit of society.

The strength of Wageningen UR lies in its ability to join the forces of specialized research institutes and Wageningen University. It also lies in the combined efforts of the various fields of natural and social sciences, and in close collaboration with government and the business community. This union of expertise leads to scientific breakthroughs that can quickly be put into practice and be incorporated into education. This simultaneously represents the Wageningen Approach and its main asset in the field of biotechnology.

#### 5.1.4 Case #3 - Agropolis International Science Park

Agropolis International Science Park was created to facilitate greater synergy between educational and research institutions in Montpellier and the Languedoc-Roussillon region, and to increase their international visibility, with support of the French government and regional authorities.

Since its inception, Agropolis International has been involved in the process of structuring of the scientific community and organisation of agricultural research and development. The association now comprises the world's largest concentration of skills and expertise in areas related to agriculture, food, biodiversity and the environment.

With 29 scientific institutions (14 research institutes, 5 universities and 10 higher educational institutes), 5 local authorities and numerous stakeholders involved in the economic development,



Agropolis International is an original and unique place for exchanges and building up partnerships and collective actions. The actions of Agropolis International Association include promotion of competences, coordination and management of working groups, support to actions of scientific community, management of collective projects and services, interfacing and facilitating missions, and organisation of scientific events.

Agropolis International has formed partnerships with technology and competitive clusters and it participates actively in European projects on technology and competitive cluster networks. The Park is also a part of global development of competitive cluster initiatives, and it includes agricultural development partners in global projects and networks.

#### 5.1.5 Case #4 – Copenhagen Bio Science Park, COBIS

Copenhagen Bio Science Park (COBIS) is the first dedicated biotechnological science park and incubator in Copenhagen. It is the result of political vision of the Ministry of Science, Innovation and Higher Education, and the Capital Region of Denmark to strengthen the biotechnological competences of the region.

Behind COBIS are two of the most experienced science parks in Denmark: Symbion Science Park and Scion DTU. These science parks have many years of experience in operating high-tech facilities, commercializing research, venture financing new start-ups, and cooperating with universities, research institutions, trade, industry, and the entire palette of business advisers.

COBIS is a member of Medicon Valley Alliance, a non-profit membership organization in the Danish-Swedish life science cluster Medicon Valley.

Medicon Valley is one of Europe's most vibrant life science clusters with a large number of life science companies and research institutions located within a very small geographical area.

A hub for innovative companies and entrepreneurs researching within biotechnology, COBIS is home to a powerful mix of organizations, housing start-ups, mid-size companies and tech trans professionals. COBIS houses biotech, industrial, life sciences and biotech services companies. It offers an ambitious growth environment, with facilities and services that match the needs of established life science companies, CROs, and entrepreneurs.

#### 5.1.6 Case #5 - Innovation Science Park Aston

Birmingham Science Park Aston, owned by Birmingham City Council is presented as two campuses: the Science & Technology Campus and the Innovation Birmingham Campus.

Innovation Birmingham Campus is the place for Birmingham's tech community. It is a one-stop-shop for innovators, entrepreneurs and investors looking to develop or fund tech start-ups with high growth potential. The Campus' strategy is to encourage people to visit, engage with the businesses based there, and attract new tenants to the Park. Aimed at supporting Birmingham's entrepreneurial tech community, Innovation Birmingham Campus runs a robust start-up support centre offering a number of packages. By creating a wide range of valuable opportunities, the missing aspects of a successful business puzzle can be solved, helping innovators and tech entrepreneurs to succeed.

Innovation Birmingham team works with and brings together the public and private sectors, creating interfaces for people with ideas, people with technologies, people with expertise and experience, and people with money. Innovation Birmingham's strategy is focused on a service offering for founders of new technology ventures, as well as more established tech businesses. Innovation Birmingham Campus



is working in partnership with a wide range of stakeholders to help shape the Smart Cities agenda and drive innovation-led regeneration across Greater Birmingham.

#### 5.1.7 Case #6 - AREA Science Park, Trieste

AREA Science Park was founded with the initial aim of providing a link between the business community and the many high-level international scientific institutions in Trieste. It is now the most important multi-sector science park in Italy and one of the foremost in Europe.

AREA Science Park is a research-driven cluster with multi-disciplinary features. The basic technology and business sectors are life sciences and biomedicine, physics, materials and nanotechnologies, electronics, informatics and communication, environment and energy. AREA plays the role of regional hub for the valorisation of research results and the diffusion of innovation, fosters technology-based business development, carries out technology transfer at regional and international level, promotes measures of high level education and mobility of knowledge, promotes national and international alliances and networks in science, technology and innovation, and supports research and industry internationalisation by promoting foreign investments in hi-tech sectors.

Top quality services, extensive relations with academic and research institutes, highly qualified human resources, coupled with a marvellous location, make AREA Science Park an exclusive environment which provides flexible solutions for tenancies, structures, instruments and support services for the development of activities based on knowledge and technology.

#### 5.1.8 Case #7 - IDEON Science Park, Lund

Ideon is a unique joint venture between the University and industry. Behind this unique initiative with the Ideon concept were Lund University, the County Administrative Board of Malmohus County and the Municipality of Lund. The purpose of forming Ideon was to take advantage of the expertise that existed at Lund University, and to create new growth companies with local ties, thus increasing the employment level in the region.

Ideon's vision of creating successful companies from the enormous wealth of knowledge and ideas that existed within Lund University was realised and, over the years, a long list of visionary companies has developed at Ideon. The Science Park built bridges that spun between research, innovations, capital and the market. More than 900 companies have developed from vision to operative business, and become sound elements in Swedish industry.

#### 5.1.9 Conclusions

Learning from benchmarked examples, successful innovation "environments" never stand alone.

The benchmarking demonstrates methods of successful cooperation of stakeholders in development of biotechnology sector within city or university areas that result in biotech discoveries and bring overall prosperity to cities, regions and countries they are located in. What these seven benchmarks have in common is facilitation of synergy between educational and research institutions resulting in development of biotechnology sector in their respective countries, and development and funding of innovative companies and entrepreneurs with high growth potential, researching within biotechnology sector.

Copenhagen Bio Science Park, for example, is the result of cooperation between already existing Symbion and Scion DTU Science Parks. At the heart of the scientific community of Montpellier and the "Région Languedoc-Roussillon" is a large range of expertise in the area of agriculture, food, environment and biodiversity. This expertise is further promoted worldwide through collaboration of



institutions, government and education sector. The case of Wageningen University and Research Centre is also an example of a good business model, as it highlights a symbiosis of the University with a strong technology transfer model and a science park.

Just like in examples we used for benchmarking, this synergy is the basis for successful formation of Campus Ultuna Bio Business Innovation Park. Their business models should serve as best practice examples for development of Campus Ultuna Bio Business Innovation Park, which will add to further development of already established biotech sector in Uppsala and Sweden. Successful development of a strong and dynamic innovation "environment" in the bio-economical sector in Uppsala, Campus Ultuna Bio Business Innovation Park, needs to represent the region's triple helix and include universities, hospitals, human life science business, regional governments and service providers, and has to be a part of the national innovation strategy.

Based on our benchmarking analysis it is clear to see that, comparing to chosen benchmarking examples, Swedish University of Agricultural Sciences has all the prerequisites of hosting a successful science park on its Ultuna campus. Science parks are catalysts for regional economic development and facilitate the creation and growth of new technology-based companies, promoting knowledge transfer from universities to industry. In addition to providing science and technology facilities, offices and laboratories, these science parks provide a meeting point for research, innovation and companies, as well as a competitive environment, and support services to help grow business projects while also providing access to experts in intellectual property and investors.

SLU is very active across all domains of biotechnology sector and is very focused on research within the field, thus making it a prefect place and source of support for development of Campus Ultuna Bio Business Innovation Park.

Campus Ultuna Bio Business Innovation Park would benefit immensely and twofold from its location. Firstly, it would be located on a university campus, making it an incubator of new ideas, interactions, human capital and research. Secondly, by creating its own business environment, Campus Ultuna Bio Business Innovation Park would combine this knowledge capital with a practical side of incubating new products and companies. Thus, Campus Ultuna Bio Business Innovation Park would become the basis of development of biotechnology sector and economic growth due to its polycentric and economically diversified business structure.

From this analysis is it clearly implied that Ultuna campus is a vibrant environment, quite suitable for including Campus Ultuna Bio Business Innovation Park into its expanding educational, research and physical capacity. Just as our successful benchmarking examples, Ultuna campus has all physical and knowledge-induced prerequisites for development and nurturing of a profitable innovation "environment" excelling in the biotechnology sector such as Campus Ultuna Bio Business Innovation Park.

#### 5.2 Outlook at national and international policies and strategies

To frame the Campus Ultuna in a national and international strategic context a summary of important policy and strategy documents is provided as well as an example of a regional strategy (Flanders). This strategic frame is used as a point of reference, particularly in chapter 6, when assessing the potential.

#### 5.2.1 European Research and Innovation Strategy for a Bio-based Economy

In order to cope with a growing number of major societal, environmental and economic challenges such as increasing global population, rapid depletion of many resources, increasing environmental pressures and climate change, Europe needs to radically change its approach to production,



consumption, processing, storage, recycling and disposal of biological resources. Overcoming these complex and inter-connected challenges requires research and innovation in order to achieve rapid and sustained changes in lifestyle and resource use that cut across all levels of society and the economy.

Europe's answer to these pressing global challenges lies in Knowledge Based Bio-economy (KBBE). The Europe 2020 Strategy sees bio-economy as a key element for smart and green growth in Europe, as bio-economy encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy via innovative and efficient technologies provided by Industrial Biotechnology.

Advancements in bio-economy research and innovation uptake will allow Europe to improve the management of its renewable biological resources and to open new and diversified markets in food and bio-based products. Establishing a bio-economy in Europe holds a great potential: it can maintain and create economic growth and jobs in rural, coastal and industrial areas, reduce fossil fuel dependence and improve the economic and environmental sustainability of primary production I and processing industries. The bio-economy thus contributes significantly to the objectives of the Europe 2020 flagship initiatives "Innovation Union" and "A Resource Efficient Europe".

The Bio-economy Strategy and its Action Plan aim to pave the way to a more innovative, resource efficient and competitive society that reconciles food security with the sustainable use of renewable resources for industrial purposes, while ensuring environmental protection. They will inform research and innovation agendas in bio-economy sectors and contribute to a more coherent policy environment, better interrelations between national, EU and global bio-economy policies and a more engaged public dialogue. They will seek synergies and respect complementarities with other policy areas, instruments and funding sources, which share and address the same objectives.

The bio-economy's cross-cutting nature offers a unique opportunity to comprehensively address interconnected societal challenges such as food security, natural resource scarcity, fossil resource dependence, climate change and creating jobs and maintaining European competitiveness, while achieving sustainable economic growth. The Bio-economy Strategy aims to address the food security issue by sustainable increase in primary production, the natural resource scarcity issue by fostering innovation to achieve productivity increases while ensuring sustainable resources, the non-renewable resources dependence issue by fostering innovation for producing quality biomass at a competitive price, the climate change issue by supporting the development of production systems with reduced greenhouse gases emissions, and the job creation issue by direct research funding and investments in all parts of the bio-economy.

Specific actions are needed to maximise the impact of bio-economy research and innovation. In line with the recommendations of the public consultation on the bio-economy, a more coherent, bio-economy-strategy-integrated policy framework, increase in research investments, development of bio-based markets and better communication and education of the public should be prioritized. Other, equally important actions include economic-sustainable and innovative spin-offs and high-tech SMEs as key for technology and knowledge development, a strong EU common policy for agriculture that promotes sustainable and competitive agricultural production, and reconversion towards low-carbon renewable-based production systems.

The Bio-economy Action Plan describes the main actions for the implementation of the Bio-economy Strategy objectives, which include investments in research, innovation and skills, reinforced policy interaction and stakeholder engagement, and enhancement of markets and competitiveness in bio-economy.



Although Europe plays a leading role in research and science, it is less successful in converting the science-based findings into commercially valuable products. This is why the Commission has developed, besides the Bio-economy Strategy, a so-called demand-based innovation policy, the Lead Market Initiative (LMI). One of the areas that this policy focuses on is that of bio-based products.

Besides these two initiatives, the European Commission has also developed Horizon 2020- the biggest EU Research and Innovation program, and Common Agricultural Policy (CAP) which encourages the development of alternative cropping systems that optimise existing and underutilised land to contribute to the EU 2020 objectives, encourages and supports farmers to diversify and supplement their incomes by investing in dedicated biomass crops for sustainable bio-based products, and supports cooperation approaches between sectors and the development of pilot and commercial scale bio-refineries across the EU.

#### 5.2.2 Swedish Research and Innovation Strategy for a Bio-based Economy

Many countries are developing strategies for a bio-based and fossil fuel independent economy, and Sweden is no exception.

On 8 September 2011 the Government commissioned Formas- a governmental research-funding agency, in consultation with VINNOVA- Swedish Governmental Agency for Innovation Systems, and the Swedish Energy Agency to submit a proposal for a national strategy for the development of a biobased economy and to propose a Swedish definition of the term. The mandate of the assignment was that the strategy should encompass research and development needs, the need for initiatives to promote innovation, the needs for coordination among research funding bodies, the performers of the research and the commercial sector, as well as the national potential.

In comparison to many other countries, Sweden has good preconditions given by natural geographic conditions, traditional industry and infrastructure, for being able to convert to a bio-based economy. Converting from the use of fossil fuels to renewable resources can also confer an inherent increase in competition for raw materials. This also provides new opportunities to complement traditional products with new products and services to maintain and improve Sweden's competitiveness. In addition to the potential within the industrial sector that has long been based on agriculture and forestry, the development of a bio-economy also offers inherent opportunities for increased use of biomass raw materials within other commercial sectors such as the transport sector, the motor industry, the construction sector and the chemical industry.

For Sweden, as for the EU, the establishment of a bio-economy implies that research and development must be complemented by innovation-fostering initiatives and measures that specifically address bioeconomy challenges, such as widespread collaboration among actors, stimulating cross-industry collaboration in research and development, stimulating the growth of strong research and innovation environments, accelerating development, verification and commercialisation of new bio-based solutions, and offering support to small and medium-sized enterprises for the commercialisation of new technologies.

In converting to a bio-based economy, Sweden has identified the following challenges: the replacement of fossil-based raw materials with bio-based raw materials, smarter products and smarter use of raw materials, more efficient use of bi-products and recycling, change in consumption habits and attitudes, and prioritisation and choice of measures.

The Swedish Government and Parliament dictates the overarching prerequisites, in terms of legislation and governance, for promoting the transition to a bio-based economy. Other important actors in



creating preconditions for switching to a bio-based economy are universities, colleges and research institutes, as well as regions, municipalities and commerce. Achieving a bio-based economy necessitates overall system solutions that require research in individual disciplines, interdisciplinary research and, most especially, trans-disciplinary research projects.

A research and innovation strategy that aims to promote the development of a bio-based economy should have both a short-term and a long-term perspective. Collaboration between the state, commercial enterprise and the performers of the research is an important prerequisite for the strategy being able to be carried out.

Achieving a bio-based economy requires research and development initiatives that include the replacement of fossil-based raw materials with bio-based raw materials, smarter products and smarter use of raw materials, change in consumption habits and attitudes, and prioritisation and choice of measures. It also includes innovation incentive measures, such as developing initiatives that specifically deal with the challenges of a bio-economy, stimulating research and development collaborations that cross branch boundaries, stimulate the growth of strong research and innovation environments, accelerating development, verification and commercialisation of new bio-based solutions, promoting the market introduction of renewable energy conductors, chemicals, materials and technologies, and offering support for small and medium-sized enterprises to commercialise new technologies and accelerate development and innovation.

The implementation of a research and innovation strategy for a bio-based economy in Sweden necessitates close collaboration between Formas, VINNOVA and the Swedish Energy Agency. In this collaboration, current divisions of roles and responsibilities are distinct and well-functioning, but there is also potential for further development.

#### 5.2.3 Bio-economy strategy in Flanders, Belgium

The Flanders region is a good example of a comprehensive move to develop strategies for a bio-based and fossil fuel independent economy.

In setting up the Flemish Interdepartmental Working Group (IWG) for the Bio-economy in 2012, the Government of Flanders provided the initial impetus for the development of an integrated, cross-policy approach to a sustainable and competitive Flemish bio-economy. Over the past year the Departments of Economy, Science & Innovation, Agriculture & Fisheries, Environment, Nature & Energy, Work & Social Economy and Education & Training, together with their agencies VITO (Flemish Institute for Technological Research), ILVO (Institute for Agricultural and Fisheries Research), OVAM (Public Waste Agency of Flanders), VEA (Flemish Energy Agency), ANB (Agency for Nature and Forests in Flanders), VMM (Flemish Environment Agency), VLM (Flemish Land Agency), VDAB (Flemish Employment and Vocational Training Service), IWT (Agency for Innovation by Science and Technology) and Enterprise Flanders, worked on a vision and Flemish strategy for the long term.

Flanders has opted to develop a sustainable bio-economy as a transition strategy to respond to the threat presented by the exhaustion and use of fossil raw materials. In addition, Flanders wants to be ready to cope with major societal challenges such as population growth, climate change, the increasing scarcity of other raw materials, pressure on ecosystems and economic development. A sustainable Flemish bio-economy provides opportunities for green growth and job creation, the further development of a circular economy, cross-border clustering, strengthening of competitiveness and the potential for research and innovation in Flanders.

A transition to a sustainable bio-economy demands a vision and a long-term strategy, which is supported by the entire Flemish government. The European strategy and action plan for a bio-economy



serves as a framework for the vision and strategy of the Government of Flanders. Vision of the Flemish bio-economy in 2030 includes three powerful ambitions. By 2030, Flanders will be one of the most competitive bio-economy regions in Europe by developing a coherent and integrated policy for the bio-economy, and by being a region in which the bio-economy sector makes an important contribution to employment and economic growth in Flanders, all partners from the various related value chains enjoy sufficient benefits and added value, and in which the strong industrial sectors that are the drivers of the bio-economy have based major research and production centres in Flanders.

It will also be one of the top regions in Europe for innovation and research relating to the bio-economy, with maximum cooperation between governments, civil society, academia, research institutions, industry, logistics and primary production, cooperation between and within the various sectors, structured strategic basic research, with numerous new spin-off companies that convert innovation and research into economic activity, and with a Flemish bio-economy cluster that has set up collaborations on innovation and research with key bio-economy regions in Europe and the world.

Flanders region will have also created one of the most sustainable bio-economies in Europe by 2030, in which Flanders is recognised as a forerunner in the efficient and flexible use of biomass, in which all the biomass used is produced sustainably and deployed along the entire value chain, in which the bio-economy guarantees sustainable employment, in which the government stimulates the market for sustainable bio-based products with adequate policy-related and stimulating measures, and in which there is broad support for a bio-economy among the key stakeholders in society.

To achieve the vision, five strategic objectives have been formulated:

- Development of a coherent Flemish policy that supports and facilitates a sustainable bioeconomy through strengthening the knowledge network in the sectors of the bio-economy, ensuring better cooperation and coordination between the policy areas and development of a clear long-term strategy that will be coordinated with stakeholders and communicated to the public.
- 2. Placing Flanders at the top for education, training, research and innovation in future-oriented bio-economy clusters by supporting bio-economy, multidisciplinary research and innovation across the entire value chain, focusing on business model innovation, linking production sectors to recycling sectors, collaboration opportunities with surrounding regions, and attractiveness of Flemish research institutions and businesses as partners for participation in bio-economy-related EU research projects.
- 3. Optimally and sustainably produced biomass, used across the entire value chain- achieved by optimal exploitation and utilisation of renewable raw materials with maximum economic and social value creation, sustainability in all its aspects in local and European production, high-quality, reliable bio-based materials, and maximum usage of locally produced biomass.
- 4. Strengthening of markets and competitiveness of bio-economic sectors in Flanders through raising awareness among consumers of the possibilities that the bio-economy and its products can offer, government support of market development, and development of necessary policy measures for a uniform and stable availability of biomass for industrial applications.
- 5. Flanders becoming a key partner within European and international joint ventures through stimulation of international and interregional cooperation, harmonisation between different policy objectives in international, European, regional or federal agreements, and cooperation in the development of generally accepted sustainability criteria at European level.



The Interdepartmental Working Group for the Bio-economy is responsible for the further development of the action plan and for monitoring its implementation. Each year the Working Group produces a re- port for the Government of Flanders on its activities and the actual implementation of the action plan.



#### 5.3 External funding sources for the development of campus Ultuna

Both SLU, Uppsala University and SVA are major recipients of both public funds and private funds for conducting research, services and contracts. The figures below show the contribution to the operational costs of research and development from various funding agencies in research areas that can be linked to the bioeconomy.<sup>5</sup>







Figure: Contributions to operating R&D-costs per funding organisation (Uppsala University)

<sup>&</sup>lt;sup>5</sup> These areas are: chemistry, biology, soil science, plant production, animal production, product research, landscaping, areal technology, areal economics, veterinary medicine



The figures show the agencies that are most important to each player in terms of research and development. Which means that are available for the broader purpose of contributing to the development of Campus Ultuna, however, is not easy to answer. For this reason, the feasibility study seeks to provide ideas for opportunities to find such financing possibilities. In particular, this concerns funding opportunities through national and international programs that can support the process and/or co-finance strategic projects. In this context, it is of course important to reflect on what actors that can co-ordinate projects and for what main purpose funds should be used. To start by clarifying the setting "actor-purpose" makes it easier to identify funding opportunities. The following discussion does not claim to be comprehensive in this context but provides a model for how future efforts to attract external funding may look like.

#### 5.3.1 Purpose of external funding

The following overall aims to seek external funding to Ultuna Campus seems to exist:

- 1. Creation of and/or further development of large, cross-border and application-oriented projects / initiatives that are in line with the profile areas proposed for Campus Ultuna.
- 2. Strengthen and develop the efforts and structures for technology transfer.
- 3. Enabling small and medium-sized enterprises to gain access to resources (money, equipment, networks) for research and development projects.
- 4. Development of the physical environment Ultuna Campus, for example through support (in different parts of the process) to the necessary investments.
- 5. Enabling the process of developing Ultuna Campus.

#### 5.3.2 The actors and their tasks

The main actors in attracting external financing is no different from those that in other contexts constitute the core stakeholders for the development of Campus Ultuna but comprise:

Type of actor	Actor
Research and academic education	<ul> <li>SLU and Uppsala University</li> <li>SVA, Statens Veterinärmedicinska Anstalt.</li> </ul>
Industry	– Companies
Innovation support	<ul> <li>STUNS</li> <li>Uppsala Universitet Innovation</li> <li>SLU Holding</li> <li>UIC</li> <li>ALMI</li> <li>Expert consultants</li> <li>mfl.</li> </ul>
Real estate/property	<ul> <li>Akademiska Hus</li> <li>Private property owners</li> </ul>
Public authorities/municipalities	<ul> <li>City of Uppsala</li> <li>Regionförbundet Uppsala</li> </ul>



Depending on the purpose of the external funding different actors have different roles. In principle, it is important that the right actor takes the lead in the right context. Listening to the financier's ideas about this is advisable. The table below shows schematically how the roles normally should look like.

	Research/ Academy	Industry	Innovation support	Real estate and property	Public actors
Large, cross-border and application-oriented projects / initiatives	LEAD	LEAD	SUPPORT	MONITORI NG	SUPPORT
Strengthen and develop the efforts and structures for technology transfer. <sup>6</sup>	SUPPORT	LEAD	LEAD	MONITORI NG	SUPPORT
Research and innovation in small and medium sized enterprises	SUPPORT	LEAD	LEAD	MONITORI NG	SUPPORT
Development of the physical environment at Campus Ultuna	SUPPORT	SUPPORT	SUPPORT	LEAD	LEAD
Drive the process of developing Campus Ultuna	SUPPORT	SUPPORT	SUPPORT	SUPPORT	LEAD

#### 5.3.3 Available funding programs and instruments

There is a large number of programs and instruments that could help the process of developing Campus Ultuna. Moreover, the program dynamics is relatively large, i.e. new programs are often launched and existing closed. The programmes described below is therefore only a small selection, which focuses on the purposes "1", "3" and "5" in the list above. Note that pure research programmes or support for e.g. excellence centres are not addressed. The reason for this is that both SLU and Uppsala University, as the introduction to this section showed already are very successful here, and that such programs are not sufficient to drive the development of Campus Ultuna forward. There are also a significant number of opportunities for individual companies to apply for project funding, e.g. from *Tillväxtverket* and *Jordbruksverket*.

#### VINNOVA programmes and instruments

#### Strategiska Innovationsområden

VINNOVA, the Swedish Energy Agency and Formas jointly run the programme "Strategiska Innovationsområden". The purpose of the initiative is to create conditions for international competitiveness and sustainable solutions to global societal challenges. The program consists of two

<sup>&</sup>lt;sup>6</sup> Technology transfer (technology transfer) is defined as the process of transferring scientific findings from one organization to another in order to further develop and commercialize these (Association of University Technology Managers, AUTM). The process often includes:

Identification of new technology

Protect technologies through patents and copyrights

Shape the development and commercialization strategies such as marketing and licensing to existing private businesses or create new businesses based on the technology in question.



parts. 1) Strategic research and innovation agendas; provide support to groups of needs owners and research practitioners to develop agendas for the development of an innovation area. 2) Strategic Innovation Area; will support the implementation of research and innovation agendas.

In the first round, five programs were selected for long-term financing of up to 200 million SEK per year by VINNOVA and the Swedish Energy Agency. The business community contributes at least as much , which means that the total could be in the order of half a billion SEK annually. In 2014 five additional programs were selected within the areas of: national/lifestyle diseases, Internet of Things, ICT electronic components and systems , graphene , and new bio-based materials, products and services. No further calls are scheduled for 2014 but already approved projects may have relevance for Ultuna Campus

#### Utmaningsdriven innovation (Challenge drive innovation)

In 2011 Vinnova started the "Challenge Driven Innovation" programme - Societal challenges as opportunities for growth. The goal of the initiative is to contribute to increasing sustainable growth by transforming and utilising cross-sector innovation in new processes, products and services that meet specific community needs in the following areas : 1) The future of health care, 2 ) Sustainable attractive cities , 3 ) Information Society 3.0, 4) Competitive production .

The program runs calls for proposals based on a three stage process comprising the steps 1) initiation, 2) collaborative projects and 3) follow-on investment. The calls for step 1, initiation, is open to everyone and will be announced twice a year. The calls for steps 2 and 3 are usually closed, which means that only those who received funding in the step before are able to apply. For Campus Ultuna the area of "Sustainable attractive cities" seems relevant. Past projects in this area have been awarded to municipalities and science parks. The support has amounted to 10 million SEK. The next deadline for stage 1 proposals is August 28 2014

#### Europeiska Kommissionens program och instrument

#### EIT-KIC

The European Institute of Innovation and Technology, EIT is set up to promote better integration of the knowledge triangle, ie the sectors of higher education, research and innovation. KIC (Knowledge and innovation communities). The network consist of several national colocation centres (nodes) in different countries. Each national centre consists of players from different parts of the knowledge triangle. KIC designated by the EIT in competition through a call process. Each national centre consists of organisations from different parts of the knowledge triangle. The networks operate in certain thematic areas and strives to improve the efficiency of cooperation between stakeholders in higher education, research and innovation. Activities at these centres include training programs at masters and doctoral level, entrepreneurial schools, valorisation of results in terms of innovation and commercialization of products and services. EITs budget for 2014-2020 is 2.7 billion Euro. Each KIC expected revenue of at least 1 milliard crowns.

Three KICs have been granted. In 2014 two new ones in the fields "Innovation for healthy living and active aging; and "Raw materials: sustainable exploration, extraction, processing, recycling and substitution" will be established.

The SME instrument



The SME instrument is intended for all types of innovative small and medium enterprises that have a strong ambition to grow and develop internationally. The instrument is based on three phases of which the first two two can receive co-funding from the European Commission.

I. Phase I:

Objective: To examine and evaluate the technical feasibility and commercial potential. Aimed at established companies with innovations newsworthy in its industry. Support: A fixed contribution amount to  $\in$  50,000 with a term of 6 months.

2. Phase 2:

Objective: advancing innovation so it becomes industrially ready and ripe for market introduction. Possible actions include demonstration activities, testing, prototype development, pilot, and scaling -up, miniaturization, design, market replication. Budget: 0.5-2.5 million  $\notin$ , over a term of 12-24 months.

The SME instrument is of interest to Campus Ultuna as it offers a whole new opportunity for individual companies to receive co-financing for innovation projects. Themes of calls will be defined in two-year programs. For the period 2014-2015 the following themes are of relevance to Ultuna Campus:

- 1. SME boosting biotechnology-based industrial processes driving competitiveness and sustainability
- 2. Clinical research for the validation of biomarkers and/or diagnostic medical devices
- 3. Resource-efficient eco-innovative food production and processing
- 4. Stimulating the innovation potential of SMEs for a low carbon and efficient energy system

#### Other

#### The Swedish national cluster programme

The Swedish National Agency for Economic and Regional Growth (Tillväxtverket) intends to strengthen the ability of clusters to increase their national and international collaboration through a dedicated program. The program's goal is to create greater capacity for innovation through creative cross-connections between and within clusters and innovative environments. Another ambition is to create a critical mass of expertise and support opportunities to reach and / or strengthen the clusters presence in international markets. The program is aimed at existing cluster initiatives, looking to change their work through collaboration and creative cross-connections between different clusters and innovative environments and / or between sectors / areas of expertise. Project duration can be for a period of maximum 3 years. A cluster initiative can be granted several projects during the program period, but not overlapping in time. Maximum amount of contribution is 1.8 million. Currently there is no open application. Public financing may not exceed 50% of total project costs.

#### LIFE+

LIFE + is the European Commission's dedicated instrument supporting environmental projects. The program for the period 2014-2020 identifies two sub-programmes: 1) Climate, and 2) Environment. The Sub-programs each have three priority areas.

- I. Environmental and resource efficiency
- 2. Nature and biodiversity
- 3. Environmental Policy and Information



The Climate sub-program prioritises:

- I. Climate change mitigation
- 2. Adaptation
- 3. Climate control and information

In total approx. 30.4 billion SEK for the years 2014-2020 is dedicated to the programme. Furthermore, a new project type, so-called integrated projects, is introduced. These will be large-scale and based on a regional or national plan or strategy. One goal of this is to integrate environmental and climate policies into other sector policies. Therefore, the projects shall be co-financed and have at least one other source of funding than the LIFE grant. For integrated projects, the application is divided into two stages. Step one is to submit a proposal for the project and step two is to submit a complete application. Deadline for submission of stage one is tentatively set to 15 October 2014.

#### 5.3.4 Overview of funding opportunities

Purpose	EIT-KIC	Strategiska Innovatiom sområden	Utmaningsdriv en innovation	SME Instrument et	Nationella klusterprog rammet	LIFE+
Large, cross-border and application- oriented projects / initiatives	4	£)	£			<i>₽</i>
Strengthen and develop the efforts and structures for technology transfer. <sup>7</sup>	4	ę.				
Research and innovation in small and medium sized enterprises				S		
Development of the physical environment at Campus Ultuna			E)			
Drive the process of developing Campus Ultuna			Ę)		£)	

#### 5.3.5 Remarks

1. The Campus Ultuna Initiative must try to take advantage of ongoing national and international flagship projects

<sup>&</sup>lt;sup>7</sup> Technology transfer (technology transfer) is defined as the process of transferring scientific findings from one organization to another in order to further develop and commercialize these (Association of University Technology Managers, AUTM). The process often includes:

Identification of new technology

Protect technologies through patents and copyrights

Shape the development and commercialization strategies such as marketing and licensing to existing private businesses or create new businesses based on the technology in question.



At national level, the Strategic Innovation areas (Strategiska Innovationsområden) are the initiatives that today brings together the most significant resources in terms of private/public cooperation. Two of these (Life style Diseases and New bio-based materials, products and services) are highly relevant for the strengths that characterize Ultuna Campus. In particular Life style Diseases will be of outmost relevance to the competence represented by SLU, Uppsala University and SVA.

On European level, the so -called Knowledge an Innovation Communities (KIC), co-financed by The European Institute of Innovation and Technology (EIT) represent a corresponding flagship initiative. To date, three KICs have been funded and two more will be established during 2014. So far no KIC is directly active in areas relevant to Campus Ultuna. However, in 2016 further KICs will be established including one in the food sector. SLU supports the initiative "Best Food" but is not a formal partner.

For the long term development of Campus Ultuna it is important that the players in the field in one way or another associate themselves with them mentioned and forthcoming flagship initiatives.

#### 2. A strategic plan for external funding is needed

The range of public co-financing is large and there are increasing resources being devoted to innovation-oriented initiatives. In addition to the financial aid as such the image gain of being a partner in flagship projects is becoming an increasingly important motivator for participating in such programmes. Therefore Campus Ultuna needs a long term strategy and action plan for how public subsidies should be accessed and managed to maximize the potential benefits.

#### 3. Improve capabilities to act on national and international calls

Given the breadth of opportunities and the complexity of navigating among different funding instruments it is justified to establish a coordinating and catalytic resource commissioned to secure strategic external funds to the development of Campus Ultuna - a "Campus Ultuna Grant Office". This actor should be responsible for monitoring calls relevant to Campus Ultuna, initiate and coordinate applications, lobbying, etc.

#### 4. Early strategic planning of the use of ERDF funds

Funds from the Regional Development Fund can be used to promote the development of Campus Ultuna. Examples of this are available from the previous programming period 2007-2013 when the so-called SMURF project supported collaborations between small businesses and academic actors. In the new programming period (2014-2020) the need to promote research, development and innovation, especially in small and medium enterprises it is further emphasized. The program also stresses the importance of innovative environments and the transition to a carbon neutral society. Campus Ultuna is thus from several perspectives a suitable initiative to target ERDF funding.



## 6 Analysis of potential

#### 6.1 Methodological approach

feasibility study The shall describe and assess which niche areas of the bioeconomy that hold promising potential for developing a unique and regionally based market offer. In this context a fundamental issue to address is on what level such "niche offers" shall be defined. This is of particular relevance for marketing and communication purpose during the process of developing Campus Ultuna as a science park. In short the challenge is to define niches



that are narrow and specific enough to raise the attention of world class actors and at the same time sufficiently inviting to companies that may not be a the very centre of the niche in question.

Of course, more than one core is possible as profile for campus Ultuna but the question remains what framework to utilise to start assessing the possible niches.

The bioeconomy includes the sectors of agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries. Within these sectors the bioeconomy encompasses the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy. The bioeconomy relies on life sciences, agronomy, ecology, food science and social sciences, biotechnology, nanotechnology, information and communication technologies (ICT), and engineering. The figure below illustrates schematically the main value chains (agriculture, forestry and marine-based) of the bioeconomy.





Figure: The bioeconomy value chains. Source European Commission

From а methodological perspective we start by investigating which bio-economy value chains (or parts of value chains) that are strong in the region. Then we will highlight what corresponding science and technology areas that also can be considered being regional strongholds. Finally, we will match these two perspectives with any structural assets available (e.g. public investments in cluster initiatives) and with the trends, challenges and needs identified in



international and national policy documents and strategies. Based on this we will point out one or more niches where we recognise good potential for Uppsala to develop strong and unique market offerings until 2030.

#### 6.1.1 Strong bioeconomy sectors

Principally the bio-economy constitutes a very small part of the regional economy (approx. 1% of employment, value-added, etc). The figure shown already in section xx of the report is worthy of displaying again (below right).

However, this is statistics based only on *aktiebolag*. When considering the studies done by *Lantbrukarnas Riksförbund*, however, the value-added is considerable higher. In addition, the borders between the bioeconomy and life sciences are increasingly blurred, i.e. companies included in the statistics under life science could possibly be related to bioeconomy as well.

The conclusion is that existing statistics do not capture and describe the bioeconomy sector in Uppsala very well, neither in terms of sub-sectors or in terms of size and types of businesses. Consequently the analysis of the potential in this study can only partially rely on statistics concerning existing industrial activities. This said, if we take the European Commission's definition of the bioeconomy (which largely coincides with that of *Lantbrukarnas Riksförbund*) we can state that in terms of number of active companies, employment, etc. the following bioeconomy subsectors are most important (not in any order of importance):

- I. Agriculture
- 2. Forestry
- 3. Food

Furthermore, we believe it justified to claim that also the biotechnology sector is of high importance for the bioeconomy. Not the least through the existence and establishment of analysis and diagnostics companies basing their business on state-of-the art technologies applicable for drug development animal at both human and animal health. With this study we are, however, not able to quantify the contribution of the biotech sector to the bioeconomy in any further detail.



Uppsala does not have any larger industrial activity in the pulp and paper sector or in chemical processing. Schematically, Uppsala's strengths in relation to the bioeconomy value chain is as illustrated by the figure below.





If we complement this generic analysis with the result of the mapping of the companies that either are located on the premises of an Uppsala science park or have passed through the publicly supported innovation system (particularly SLU Holding and Uppsala Innovation Centre) some further light is shed on what sectors and application areas existing companies are active within. As outlined in section xx this mapping includes some 45 companies, though not all of them are active today or even located in Uppsala. The pie chart below shows the number of companies per sector, the highest number of companies can be found in 1) food/health, 2) Medicine/pharma and 3) plant technology/ protection. It is worth noting that the spread of companies over sector/application area is quite even, although food/health and pharma is dominating. It is also interesting that water protection and fishery solutions seem to be a quite dynamic area although the established industry is close to non-existing in the region.<sup>8</sup> All-in-all companies located close to the city of Uppsala and start-ups match relatively well the general profile of the bio-based industry in the region, possibly with the exception of forestry companies. It can be assumed (but not verified within this study) that companies located close to Uppsala city have a higher value-added and higher productivity than companies in other municipalities.





<sup>&</sup>lt;sup>8</sup> As according to Lantbrukarnas Riskförbund 2010



Finally, the fields of activity of the larger bioeconomy companies presented in section xx should once again be highlighted.

Company	Field of business	Employees	Turnover (mio SEK)
SMP	Machine- product- and environmental safety.	52	60
JTI	Industrial research in agricultural engineering and environmental technology	46	43
Novavax	Vaccine targeting seasonal and pandemic influenza	24	18
Kruuse	Veterinary equipment	21	230
Boehringer Ingelheim Svanova	Veterinary diagnostics	20-49	
Lantmännen BioAgri	Plant protection	n/a	17
Incotec	Plant protection	7	10

#### To summarise:

The existing industrial base within the bioeconomy suggests the following broader niches:

- I. Plant protection and plant biotechnology
- 2. Safe and healthy food
- 3. Pharmaceuticals for animals and humans
- 4. Diagnostics and analysis technology

#### 6.1.2 Strong science and technology areas

The science base (comprising mainly SLU and SVA but also Uppsala University) has been described in chapter xx. Here we will try to highlight to what extent and in which areas the science base is partnering with industry or other stakeholders to solve business or societal challenges and take this as an indication of what niches that could be strengthened by the regional research and educational capabilities.

First, when comparing public organisations' funding of research at SLU with that of private companies some differences can be noticed (see figures below) in relative terms. In particular, companies spend more on the research areas "animalieproduktion", "markvetenskap" and "växtproduktion) and less on "Biologi" than public financiers do. The explanation for this is likely to be that biology as research areas is of more basic nature than the other.





Figure: Private companies funding of research at SLU. Source: SCB





SVA is in this sense not directly comparable to SLU or Uppsala University. However, SVA diagnostics (animal diseases) is more or less fully financed by fees from users.

A joint initiative of SLU, Uppsala University and SVA of high dignity is "One Health Sweden". As mentioned earlier One Health Sweden is a collaboration platform for researchers with interest in zoonotic infections but also extending to the importance of food and feed for animal and human health.

The generally available statistics provide only a rough idea of where strong niches can be found however. A closer look at SLUs largest (in terms of funding) industrial partners illustrates more clearly what types of competence firms look for (for SVA no data on individual firms or projects has been available).



		Intä	kter
Näringslivspartner		2013	2012
Medivir AB		4 994	1 280
Elforsk AB	"SLU i Uppsala (Skoglig mykologi och	2 738	1 731
Forsmarks kraftgrupp AB	patologi, Mikrobiologi och Kemi) och Medivir AB samarbetar för att identifiera	2 700	2 084
Zarkara Genomics AB	och utveckla nya läkemedelssubstanser mot	2 431	1 795
OKG AB	antibiotikaresistenta bakterier.	2 180	1 681
RINGHALS AB	"Vacciner inom	1 746	1 555
DeLaval International AB	djurhälsovården"	1 567	1 000
Intervacc AB	"Probiotika"	1 500	1 500
Biogaia AB		1 300	1 300
Q-med AB		1 205	520
Svensk Kärnbränslehantering AB	"Konstained enindelväv"	1 202	733
Svensk MKB AB	Konstgjord spindelvav	622	1 477
Spiber Technologies AB		516	1 024

SVA claims to have ling-term industrial users of their safety laboratories. Exactly what these companies do is not known to us, however, it concerns biotechnology companies so a fair assumption is that they are active in the field of pharmaceutical development.

It should be noted that his by far is not the full picture of science-industry co-operation in the region, however, they may represent a few of the more advanced co-operations and can therefore be used as indicators for potential niches. A further field of competence that is not a research areas of its own rather an enabling technology is data management and visualisation.

In this context the thematic research programmes run by the SLU Faculty of Natural Resources and Agricultural Sciences should be highlighted as well as they are jointly funded by SLU and industry. Three of these programmes are related to bio-energy, one to food and one to plant protection.

#### To summarise:

The science and technology base within the bioeconomy suggests the following broader niches:

- 1. Plant protection and plant biotechnology
- 2. Safe and healthy food
- 3. Pharmaceuticals for animals and humans
- 4. Bio-energy

#### 6.1.3 Alignment with international and national policy and strategy

The third perspective that may influence the definition of potential niche markets is to what extent industrial sectors and science based are in line with international and national policies and strategies relevant to the bioeconomy. As outlined in section two there are such policy documents and strategies on the European level as well as in most European member states including Sweden.



When looking at the European level the strategy "Innovating for Sustainable Growth: A Bioeconomy for Europe" links the need for action to promote the bio-based economy to substantial benefits with regards to the grand challenges of our society. This link is as illustrated by the table below (own interpretation). In the right-hand column the apparent relevance to Uppsala and Campus Ultuna is indicated.

A Bioeconomy for Europe	Grand Challenge	Relevance Campus Ultuna
Ensuring food security	Health, demographic change and wellbeing;	
	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy;	₿.
Reducing dependence on non- renewable resources	Secure, clean and efficient energy;	E)
	Smart, green and integrated transport;	
<ul> <li>1.Mitigating and adapting to climate change</li> <li>2.Managing natural resources sustainably</li> </ul>	Climate action, environment, resource efficiency and raw materials;	5
Creating jobs and maintaining European competitiveness	Europe in a changing world - inclusive, innovative and reflective societies;	1

The Swedish national strategy for the biobased economy is a variant of the European. A number of key challenges are listed as well as the corresponding need for R&D. The Swedish strategy emphasises the need to reduce dependency on fossil fuels and raw material efficiency but also highlights a few other prioritised areas snd R&D-needs as illustrated in the table below. The table also indicates our assessment of the relevance to these priorities o Uppsala/Ultuna.

Challenge	R&D-need	Relevance
The replacement of fossil-based raw materials with bio-based raw materials	<ul> <li>Intensified production of bio-based raw materials (extract):</li> <li>a) Nutrient and fertilizer optimization systems</li> <li>b) Crop and animal breeding</li> <li>c) New and improved biomass properties</li> </ul>	+++
Smarter products and smarter use of raw materials	<ul> <li>Further refining of the biomass into products:</li> <li>a) Bi-products and waste products become raw materials</li> <li>b) New products</li> <li>c) Biorefineries</li> </ul>	++
Change in consumption habits and attitudes	<ul> <li>a) Transport</li> <li>b) Distribution and storage</li> <li>c) New services</li> <li>d) Consumer behaviour</li> </ul>	+



	e)	Environmental consequences	
Prioritisation and choice	f)	Socio-economic consequences	
of measures	g)	Conflict of objectives	
	h)	Policy instruments	

Although both the European and the national strategy are quite generic in their nature they provide some guidance on what the key areas for future action and investments should be. In particular there is a need for new technologies and solutions that optimise the output of biobased raw materials, resource efficiency, recycling and new bio-based products. Also change in consumer behaviour and demands are considered to be of critical importance.

#### To summarise:

International land national strategies for the bioeconomy suggests the following broader niches:

- I. Plant biotechnology
- 2. Bio-energy
- 3. Recycling and new bio-based products
- 4. Management and utilisation of environmental data

#### 6.2 From competences to unique market offerings

What are the sweet spots, in terms of unique market offerings, that are made possible by smart utilisation and combination of the strong fields of competence within the bioeconomy in Uppsala?

The review of industrial and academic strengths together with their alignment with international and national strategies as well as the support from specific regional initiatives gives at hand that the following areas have or have the potential to form globally unique offerings.





Area	Unique assets	Synergies		
Biotechnologically supported plant protection and breedingi	<ul> <li>Plant-related research is all together the strongest research area and SLU and strongest in Sweden. Plant research is also supported by several string research groups (in particular within biotechnology) at Uppsala University.</li> <li>Very good access to competence</li> <li>Equipment and facilities that can be used for product development and demonstration are at hand</li> <li>At Campus Ultuna there are at least two strong industrial actors within this field. One of the them is a global player in plant protection</li> <li>Indications of significant entrepreneurial activities in the area.</li> </ul>	SLU and Uppsala University have mutually reinforcing research activities relevant to this field.		
Safe and healthy food	<ul> <li>Food production is one of the stronger industrial subsectors of the bioeconomy in Uppsala and at the end of the value chain starting with agriculture</li> <li>This areas has its research base in plant production and animal production which belong to the strongest research areas and activity areas of SLU and SVA respectively. A strong subfield is fibres and health: e.g. related markers for cancer and diabetes.</li> <li>Very good access to competence</li> <li>Safe and healthy food is part of the One Health platform that ties together SLU, SVA and Uppsala University.</li> <li>Indications of significant entrepreneurial activities in the area.</li> </ul>	SVA and SLU has strong common interest in this area and via the One Health platform Uppsala University completes the triangle of research capability.		
Animal and human medicine	<ul> <li>Veterinary medicine, monitoring and diagnostics of animal diseases as well as veterinary medicine are true strongholds of SVA and SLU.</li> <li>The convergence of animal human medicine brings Uppsala University closer to SLU and SVA. In particular in fields like vaccine research (for zoonotic diseases) but also resistance towards antibiotics.</li> <li>Strong innovation support through UppsalaBio.</li> <li>Unique research facilities available.</li> <li>Very good access to competence</li> <li>Internationally competitive companies are present in Uppsala in this area</li> <li>Indications of significant entrepreneurial activities.</li> </ul>	Strong common interests between SLLU, SVA and Uppsala University. Again, the One Health initiative provide a joint platform for collaboration.		
In addition to these three areas we would also like to put forward two additional ones here we believe that strong niche offerings can be developed.				
Management and utilisation of (big) environmental data	<ul> <li>SLU is commissioned by different authorities to carry out continuous environmental analyses. This has resulted in strong c data and to support decision making. This competence could well be the source of spin-outs and could also be a competer internationally; not the least to developing countries</li> </ul>	ompetence in managing big nce than can be sold		
Bio-energy	<ul> <li>The bio-energy area lacks today strong industrial actors in Uppsala. However, there are several large ongoing industry coll SLU and energy production is a very strong area at Uppsala University (Ångström), which should make synergies possible.</li> </ul>	aboration programmes at		



#### 6.3 Quantified potential

The quantification of the potential I in terms of number of companies, the need for office space and other facilities is of course very difficult. There is little relevant historical data to build and predictions upon and, considering the fact that the bioeconomy sector of Uppsala today is not very industrialised (although academic research is very strong), it is also difficult to assess the potential of individual companies.

An attempt to quantify the expectations is therefore more to be seen as an attempt to formulate viable and quantitative objectives – a situation to strive for at Campus Ultuna until 2030.

Our approach to quantify the potential relies on the basic assumption there are three general ways of sourcing companies to Campus Ultuna:

- I. Start ups
- 2. Relocation of existing companies presently located elsewhere in Uppsala or Sweden
- 3. Investments (new) from foreign companies

#### 6.3.1 Start-ups

Start-ups can have different origins (existing firms, individual idea or research results). As data is scarce on the two first we will focus on cases that in one way or the other are captured by the publicly supported innovation system, i.e. primarily the university-based structure such as Uppsala University Innovation and SLU Holding. The incubator IUC is also important in this context.

As indicated earlier in this report the public innovation systems reviews hundreds of ideas every year and the number of ideas tend to rise along with increasing resources of the support system. Most ideas never transform into a company however and many ideas that do are not supported or even noticed by the public system. Our estimation of the potential numb research-based starts-ups in the bioeconomy sector (not only the area mentioned earlier in this report section is therefore to be taken for what it is – estimation, not a prediction.

Of the bioeconomy companies located in Campus Ultuna today none can be classified as a start-up, although several can traced back to research carried out a the universities.

Uppsala Innovation Centre has supported 260+ companies and business projects since starting as an incubator in 1999. As mentioned earlier some 25-30 of these can be related to the bioeconomy sector. Assuming that there is a relatively equal flow of cases each year this implies that approx. two bioeconomy business cases are supported yearly.

Uppsala University Holding has a present portfolio of 38 companies. In 2013 fewer new investments than previous years were undertaken, however more follow-on investment. The relevance to the bioeconomy sector is not as obvious as when it comes to the portfolio firms of SLU Holding but there are a number of companies in the "life science" group that should share some common platforms. If a broader profile for Campus Ultuna is chosen (see section xx) start-ups in other technology areas may also be candidates, this may in particular concern energy-related companies.

Today many UU Holding companies are located to Uppsala Science Park (USP). The disadvantages of USP were highlighted and discussed during the stakeholder workshop of the feasibility study. In particular growing companies tend to have difficulties in finding more office space and there are also some accessibility problems, e.g. for certain deliveries. This said it is unlikely that Uppsala University will be a large source of start-ups that will located to Campus Ultuna until 2030.



Today SLU Holding has portfolio of nine companies of which seven can be classified as "real" research start-ups. Consultations with representatives of SLU Holding during the feasibility study yielded that the location of some ten research-based companies to Campus Ultuna and originating from SLU is a realistic estimation for 2030.

Finally and as appoint of reference, when looking at the number of companies located in the different good practice "environments" described we pick up the following figures: 1) The AREA Science Park in Trieste hosts 85 tenants, including research entities however, 2) Agropolis International close to Montpellier hosts 20 companies, 3) The Copenhagen Bio science park COBIS hosts some 40 companies.

#### 6.3.2 Relocation companies

If the estimation of the number of start-up companies was difficult, estimating the number of companies that may relocate to Campus Ultuna is even harder.

A starting point is of course the relevant companies that today occupy space elsewhere than Ultuna but have some connection to the region. Again we face the question about the Campus Ultuna profile. If only companies that clearly can be related to the bioeconomy are considered the number of theoretical relocation candidates are probably not higher than 50. The total number of such companies within a reasonable distance (45-60 minutes of travelling) has not been analysed in thi study.

If a broader profile than "Bioeconomy" is opted for, e.g. including energy and cleantech, the number of potential relocation candidates increase significantly. Uppsala Cleantech has identified some 60 cleantech companies based on SNI/NACE-codes. We have not carried out any further analysis of these companies within the feasibility study but it is likely that some of them are plausible candidates for relocating to Ultuna.

#### 6.3.3 Large companies and organisations

The attractiveness of a science park is intimately connected with the image of tenants. This is why virtually all initiatives to develop or renew a business park starts with the identification of a "dream tenant". Please refer for example to the case study on Barcelona provide in the appendix. A dream tenant is normally a large, multinational company but can also be prominent public institutions. An example of this is the European Centre for Disease Prevention and Control (ECDC) with headquarters in Solna. Once a dream tenant has located things tend to go much easier.

Presently, there are no full-fledged dream tenants of the bioeconomy around in Uppsala. However, there is representation of multinational companies, e.g. Incotec and Boehringer Ingelheim Svanova. Again, the estimation of the potential for attracting such tenant to Ultuna is more of wishes and objectives than reality-funded forecasts.

During the stakeholder workshop a few ideas concerning dream tenants where mentioned. Examples of such organisations are Novozymes, a Danish biotech company with approx. 5000 employees and *Livsmedelsverket. Livsmedelsverket* is presently looking for new office facilities in Uppsala and Ultuna is a realistic candidate.



#### 6.3.4 Summary of estimated potential

The table below summaries the estimated number of companies and corresponding employment and arising need for office space. Note that these figures are for bioeconomy companies only.

Type of company	No of additional firms on Campus in 2030	Employment	Need for office space
Start-ups/research firms Spin-outs and spin-offs from SVA, SLU, Uppsala University and already established research intensive companies	20	80	800 m2 (40 m2 per company)
Growth-oriented SMEs Relocation of companies within Uppsala region and Sweden. Probably/preferably smaller mid-caps with expansion plans.	10	400	3500 m2
Large companies or large organisations For example R&D-units, sales offices, in best case headquarters of large multinational organisations	3	100 - 1000	5000 m2



## 7 Summary and recommendations –road ahead for Ultuna

#### 7.1 Proposed profile for Campus Ultuna

Our conclusion is that the feasibility study gives sufficient indications that a pure bioeconomy profile for Campus Ultuna will not provide a sustainable basis for a world class research and innovation environment. The main argument for this is the presently weak industrial activities and lack of midsized and larger companies. Therefore the profile needs to be broader.

To broaden the profile with up to 3-4 focus areas usually works well in innovation environments, as long as the areas are mutually reinforcing.

The question is then, when extending the profile of Campus Ultuna, which related areas could be mutually reinforcing?

Close at hand is the life science sector, which is of considerable strength in Uppsala today and where there are many links and shared networks already. The One Health initiative has been mentioned repeatedly and many companies developing pharmaceuticals and diagnostics technologies have both animals and humans as target beneficiary.

If campus Ultuna adds life science to its profile what is the added value for Uppsala and the companies?

One argument is that the two present locations for companies (Uppsala Science Park and Uppsala Business Park) both have their drawbacks and limitations. USP has difficulties in providing growing companies with suitable office space and accessibility is suboptimal. UBP is far away from the city centre and also far from planned future housing areas. Furthermore, UBP is, for good and for bad, still characterised by the activities of Pharmacia, which makes the site less attractive to some companies. With other words; for life science companies Campus Ultuna may constitute an alternative finding its selling points in 1) Appropriate office space for growing companies, 2) Relatively close to the city centre, **3**) Atmosphere.

"More like an industrial area than USP and more integrated in social life than UBP!"

Pharmaceutical applications and medical issues alone do not make complete justice to the strengths of SLU and existing industry, however. It would make sense also to brand campus Ultuna as centre for Food, Health and Wellness. There are many synergies, in particular image-wise, with the life science sector to capitalise by doing so. The on companies settling on the area will be quite different in many cases, though.





Finally, it would make sense also to position Campus Ultuna as a site for cleantech companies; in particular companies in the field of energy. This could build a bridge between the biobased energy research of SLU and the renewable energy- and material research at Ångströmlaboratoriet.

### **Campus Ultuna**

 a thriving science and business innovation park where solutions to the major health and environmental challenges of our time are sourced in the interplay of biological raw material, food & feed, animals and humans.

Within the frame of this profile Campus Ultuna must develop its mission, vision and strategy. To define the precise wording and meaning of the mission and vision is likely to be a longer process that involves many stakeholders. What is suggested below are statements in "directional" terms meaning that vision and mission respectively should be formulated in line with these general statements.

Vision	Uppsala Ultuna should become a globally attractive spot for leading companies, researchers and entrepreneurs within the defined profile areas.
Mission	The mission of Uppsala Ultuna is to provide optimal conditions for business, research and innovation activities for the tenants.

#### 7.2 Recommended key actions

The general process proposed for developing Campus Ultuna is based on the theoretical model for Innovative Urban Areas as elaborated upon in chapter 3. According to this framework the development process can be described as according to the figure below.





#### Figure: General IUA development model.

Each plan and activity will be designed, executed and assessed according to the 4 central areas of the model, which guide the project all through its life cycle:

- 1. **Urban planning and real estate:** The urban space physical transformation planning process, with the definition of land uses, property compensations, legal issues, construction, infrastructures and traffic, as well as the criteria for land management and real estate marketing.
- 2. Business and S&T activities and institutions: The creation, attraction and growth of companies, institutions and centres of expertise (universities, technology centres, R&D institutions, etc.) based on the structuring and dynamisation of economic and knowledge clusters.
- 3. **Innovative Ecosystem:** The field of action of the park beyond its physical dimension. The implication and revitalization of the existing industrial and knowledge assets, and the creation of activities and programs aiming at promoting collaboration, innovation and joint ventures, within or outside the park. Cluster strategies are developed in order to foster the creation and transfer of knowledge between economic and knowledge institutions, and to generate productivity-enhancing and internationalization projects. A good entrepreneurship program and the presence of project and start-up incubators are frequent add-ons to the innovative ecosystem. A strong interaction with citizens and the civil society is crucial, beyond the purely economic or technologic areas.



4. **Governance and Marketing:** The definition of the global governing body and of the governance of new institutions (shape, composition, powers, functions, etc.) optimized to bring together diverse agents (companies, government, universities, other centres of expertise, intermediate organizations, associations, civil organizations, etc.) and to ensure their strategic, political and economic development and sustainability. This phase also defines the basic elements of the marketing plan and communications strategies of the new area in order to accelerate the arrival of economic activity and real estate commercialisation.

For Campus Ultuna, real estate already exists and some of the development steps in the model above have already taken place. However, taking this into account, within the framework model the following concrete actions on short, medium and long term are recommended.

#### 7.2.1 Short term actions

- 1. Communication and anchoring of the campus Ultuna profile and focus areas among all stakeholders, through a workshop based process
- 2. Run vision development process, through interaction with Quad Helix actors.
- 3. Identify "dream tenants" within profile focus areas.
- 4. Start/align regional investment promotion efforts with Campus Ultuna vision

#### 7.2.2 Medium-tem actions

- 1. Approach dream tenants with concrete offerings
- 2. Recruit international business firms and actors to locate to Campus Ultuna
- 3. Develop integrated project plan, milestones and define sub projects, according to development model above
- 4. Sign up project consortium of partners to proceed with planning projects
- 5. Identify, plan and prepare funding applications for individual project preparation
- 6. Start to prepare the first individual projects, including engineering studies and construction permits etc. when needed

#### 7.2.3 Long-term actions

- 1. Further continue to attract the stakeholders of the Quad helix concept (Business, Academia, Civil, Government) into the innovation environment
- 2. Transform the project organisation into a long term line organisation for strategy development, management of the Campus, and further divide project into sub streams
- 3. Build networks and bridges with other innovation environments internationally, for regular sharing, networking, inspiration and direct investment and establishment recruitment
- 4. Develop and enhance processes and business support services from campus management to companies
- 5. Continuously develop the place brand through activities and keep the vision alive



#### 7.3 Performance goals

The following is only food for thought:

- 1. Until mid-2015 a formal organisation for the development of Campus Ultuna should be established.
- 2. Until 2020 academic collaboration shall have developed, e.g. by location of inter-organisational research centres to Campus Ultuna. E.g. institutions, departments and research groups dealing with research on zoonotic disease from Uppsala University, SLU and SVA could establish a joint research centre at campus Ultuna.
- 3. Until 2020 industrial activities in the profile area of Campus Ultuna should have doubled, i.e. reached 20-25 companies.

#### 7.4 Risk assessment

- 1. A weakness of the concept are the relatively modest industrial activities in Uppsala in the intended field. The complicated and long-term processes of securing companies to the campus may cause it to fail. Sustainable commitment to focus areas, branding and endurance is needed!
- 2. The strong research and academic actors in Uppsala need motivation to continue to integrate their agendas for the good of campus Ultuna. It must be ensured that all participating organisations are incentivised properly.
- 3. Uppsala is not alone in making efforts to create a bioeconomy innovation profile. Only in Sweden at least three other regions (Skåne, Västra Götaland and Östergötland) have similar plans. Uppsala must ensure a) to find a sweet spot niche that lowers domestic competition and b) not to get behind in marketing and lobbying for its case.





... because the execution of an idea is always more important than the brilliance of the thought...

(Harvard Business Publishing – Morgan, Levitt & Maleck – INVEST model)



www.bearing-consulting.com | blog.bearing-consulting.com

